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Contractors and Engineers Monthly

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Highlights Of This Issue

- **Tunnels on Roza Project.**
  Two tunnels near Yakima, Wash., one 8,231 feet long and another 9,588 feet long, had to be driven through a variety of materials, including camels' bones and mastadon teeth.
  See page 2.
- **County Road Financing.**
  The County Highway Superintendent of St. Clair County, Ill., discusses the county-state relationship as it concerns county roads and describes the road work in his county.
  See page 2.
- **Cotton for Roads.**
  The work carried on by state highway departments, under the supervision of the U. S. Bureau of Public Roads, in the use of cotton fabric as reinforcing for bituminous roads is discussed.
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- **Soils Studies.**
  The necessity of such studies prior to the construction of low-cost roads, as well as methods of making such studies are discussed by F. C. Lang.
  See page 9.
- **Concrete Road in Louisiana.**
  "A stitch in time" seems to have been the motto for the construction of the Bonnet Carre spillway approach fill highway over that famous "bottomless hole" near New Orleans, for mud-pump connections were built into the road to simplify the correction of any settlement which may occur.
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Pushing Snow Back on the Shoulder of a Massachusetts Highway with a V-Plow Mounted on a Heavy-Duty Four-Wheel-Drive Truck

Winter Maintenance In a Snowless Season

Bay State Found Sleet and Ice More Expensive to Fight Than Snow in Program for Safe, Open Roads

By J. E. LAWRENCE, Maintenance Engineer, Massachusetts Department of Public Works

(Photos on page 56)

✦ THE WINTER of 1936-1937 will go down in the records of the Weather Bureau for the Commonwealth of Massachusetts as the "snowless winter" because the snowfall, particularly in the eastern section of the Commonwealth, was the least of any winter since records have been kept. Fifteen years ago it would have cost only a few thousand dollars to maintain travel under these conditions but in these days of heavy and fast travel it is necessary to keep the roads practically clear of snow and all dangerous places at intersections, curves, and grades must be well sanded. The cost of plowing the snow was very small but the work of sanding the highways was in excess of the average year, and this type

(Continued on page 25)

Complete Hot-Mix Plant For Mississippi Road Job

One-Man Control Features Plant Set Up By Wesco for Black Base, Topeka Top

(Photo on page 56)

✦ THE FINE grading and paving of 13.615 miles of U.S. 49 north from Magee, Miss., to Mt. Olive was completed last summer by The Wesco Co. of Chattanooga, Tenn., well within the 175 working days allowed by the contract. The 20-foot pavement consisted of a 3-inch asphaltic concrete base on the primed gravel subgrade and topped with a 1½-inch Topeka mix. Fine grading started March 1, 1937, and average weather continued throughout the contract with a minimum of lost time due to rain or other causes. The contract consisted of four Federal-Aid Projects, 16, 165 and 200 H and I.

Fine Grading

The present project is a relocation of U. S. 49, greatly improving the alignment and using only about 25 per cent of the old right-of-way. Grading consisted of shaping the subgrade and ditches and shifting some subgrade material, due to slight changes in grade. Most of the work was done with a No. 11 Caterpillar patrol, a Caterpillar Sixty gas tractor, a D7 Caterpillar, a Caterpillar Sixty-Six motor grader and the heavier cuts and finishing with a Lorain 40 powered with a Waukesha engine. The contractor used his own fleet of fifteen Chevrolet trucks equipped with Anthony bodies and Wood hydraulic hoists for hauling dirt, gravel base and the hot-mix material when surfacing began. In addition there were four Chevrolet water trucks and two utility trucks for general service.

After the subgrade was shaped, gravel was hauled in and spread in two lifts 21 feet wide between wood forms to provide a 7½-inch compacted gravel foundation for the asphalt base and surface courses. The gravel was then permitted to compact under traffic. As traffic has a tendency to use the center of any such roadway the contractor placed slash lumber along the center of the road and forced traffic to use the outer edges, thus compacting the section of the roadway foundation that requires the greatest strength. The road was kept open to traffic for compaction until the subgrade was considered thoroughly consolidated by the engineers. The road was maintained by blading throughout the whole time it was under traffic.

After compaction under traffic, final shaping, and rolling with a 3-wheel roller, the roadway was primed for a width of 21 feet with tar prime and allowed to cure for approximately 7 days before paving began. Koppers tar was applied by the producer at the rate of 0.3 to 0.4 gallons per square yard for the prime.

(Continued on page 29)

A. R. B. A. Road Show To Be Smash Hit

Special to Contractors and Engineers Monthly

CLEVELAND, OHIO, Jan. 7—By special train and plane, from the Deep South, from the Far West, from every state in the Union, Canada, Mexico, South and Central America and Europe, a record-breaking army of more than 24,000 road builders is heading for Cleveland, Ohio, to attend the "Barnum and Bailey" of the highway world, the 1938 "Five-Star" edition of the Road Show-Convention of the American Road Builders' Association, during the week of January 17.

"Ringmaster" Charles M. Upham promises not three but five rings of everything new under the highway sun with a Road Show presenting 400 exhibits of novel machinery, materials and methods, occupying 6½ acres of space and representing an investment of $10,000,000, and a Convention program of a thousand surprises headed by a nationally prominent speaker on a subject closely akin to road building.

Like its namesake, "The Greatest Highway Show on Earth" will appeal to young and old alike. A delegation of the entire senior class and a part of the junior class of the A.R.B.A. student chapter of the University of Pittsburgh will travel to Cleveland to see the highway "circus" of everything new in road-building "acts." Not to be outdone by the youngsters, a select contingent of "Old Timers" will trek for the second time and have a thing or three to say about the grand adventure that has been the history of the Association.

Contractors by the score in special carloads will converge on Cleveland's public auditorium to swell contractor attendance at the 1938 Road Show-Convention to an unprecedented high. The majority of these will come from A.R.B.A. contractor-member affiliate groups. So, the Road Builders' New Year starts with the loudest BANG in 35 years.

MEMPHIS OVERPASS

C. & E. M. Photo

Heavy Timbers Carried on the Boats Supported a Lorain 40 Goosenock Crane Which Handled the Deck and Girder Concrete for a Long Overpass. See Page 33.

Roza Irrigation Tunnels

Bores Driven Through Varied Rock Formations

Morrison-Knudsen Has Completed 80 Per Cent Of Two Concrete-Lined Tunnels in Wash.

By HENRY W. YOUNG

(*Photo on page 56*)

✦ THE CONTRACTS for the construction of two tunnels on the Roza Division of the Yakima Irrigation Project, near Yakima, Wash., awarded to the Morrison-Knudsen Co., Boise, Idaho, at an approximate bid price of $1,350,000 for the two projects, were made unusually interesting and problematical by the varied nature of the materials encountered, particularly in the second of the two tunnels, No. 3. A fairly representative section of the geological history of the earth's crust might be pieced out of the wastage from the tunnels—cemented gravel, blue clay, volcanic ashes and clinkers, fine-grain sandstone, dense basalt, shattered basalt, porous lava, shale, pockets of mud and others of broken rock, etc., not to mention a fairly complete boneyard containing mastodon teeth and the bones of a very ancient camel. It was evident that in running the bore they had looked in on a prehistoric river bed which had once been a death trap for such monsters.

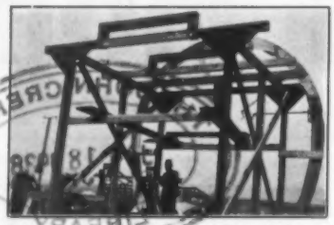
Old Omar said, "There never blows a rose so red as where some buried Caesar bled." But that needn't disturb you when, in the future, you are eating Roza apples and pears. The camels' bones and mastodon teeth were from a long time back, and the fruit will probably be excellent.

Tunnel No. 1 is approximately 8,231 feet long, of the conventional horseshoe type, with a diameter of 17 feet after the concrete lining of a minimum thickness of 18 inches is in place. The drop is 0.10 foot per 100 feet, and the excavation approximately 100,000 cubic yards. Tunnel No. 3 is of the same cross-section, approximately 9,588 feet long, with a drop of 0.092 foot per 100 feet and involved approximately 115,000 cubic yards of excavation.

Daily Progress Variable

Work began on No. 3 in February, 1936, during which month an open cut leading to the north portal was started. Actual tunneling began in March and was going at a good rate by April of that year. Considering that it was necessary to use steel supports of 6-inch 12½-pound I-beams, bolted at the top and resting on blocks at the footing, on nearly one-third of the work, the daily average of over 20 linear feet was noteworthy. In some places the work was exceptionally fast, as there were many months of 800 to 900 linear feet and in November, 1936, the distance gained was 1,007 feet. However, tunnels have a way of keeping the tunneler from becoming too self-satisfied, so along in March, 1937, No. 3 threw a fit in the nature of an influx of water and a cave-in which all but halted progress while the situation was being brought under control. During that month, the progress was only 64 feet.

Tunnel No. 1 was started in August, 1936, and went along with exceptional uniformity of between 500 and 900 linear feet a month, without any difficulties, so that the two were ready to hole through at about the same time last June, with some competition between the crews to see which would be first, No. 3 winning by the proverbial nose.



This Template Checks the Tunnel Cross Sections

Well-Equipped Job

Exceptionally well-planned procedure, plenty of equipment, some of special design, and 24-hour operation by shifts of experienced miners put the work through at the rate of progress achieved. In both tunnels, the full face was worked at once. Equipment representing an investment of nearly $250,000, including jumbos of special design, Worthington pneumatic feed drills, two Conway 75-hp electrically operated muckers, five electric and one gas locomotives and 50 Western and American Car & Foundry cars of 4 and 5-yard capacities.

For Tunnel No. 1 there was a compressor plant consisting of an Ingersoll-Rand Type-10 compressor of 1,300 cfm and a Type XB of 1,100 cfm, which furnished air for the heading through a 6-inch pipe from a 12 x 4-foot receiver tank. Every 1,500 to 2,000 feet along the tunnel, another receiver tank was

(*Continued on page 24*)

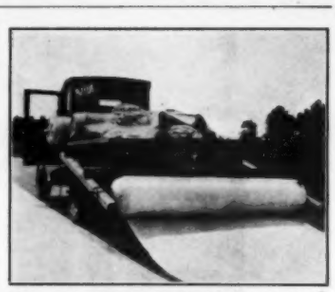
Special Trimmer Used To Check Projecting Rock Before Lining

✦ AFTER Tunnels No. 1 and 3 on the Roza Project, for which Morrison-Knudsen Co. has the contracts, were holed through, it was necessary to remove all rock protrusions before the concrete lining of 8-inch minimum thickness could be placed. To discover and mark all such projections, an adjustable trimmer, designed by Bud Rainey, Concrete Superintendent for Morrison-Knudsen, who had just come to this project from the Los Angeles Aqueduct job, was built outside the portal of No. 3 tunnel.

This adjustable trimmer moves along through the bore on wheels running on the jumbo rails. At the rear in the illustration is seen the arched template which represents the inside line of the concrete lining of the tunnel. All along the outer edge of this template, wipers or feelers are mounted, 8 inches out from the template. Any projection touched by these feelers will, of course, be within the 8-inch limit represented by the minimum thickness of the lining.

In moving the trimmer through the tunnel over the irregular jumbo rails, provision is made to keep the template centered at all times. This is done by means of a range finder mounted in the center of the template arch. This is a steel plate which hangs from the upper part of the framework in which there is

(*Continued on page 17*)



One of the Many Simple Devices Used to Lessen Time and Labor of Placing Cotton Fabric on Roads

Cotton Fabric on Bituminous Roads

U. S. Bureau of Public Roads Has Prepared Article on Current Practice in Experimental Work Carried on Under Its Direction

✦ THE PUBLICITY that has been given to "cotton roads" during the past two years has aroused a considerable interest in them, not only because of their possible importance to the cotton-growing states but also because of the apparent novelty of the type of construction. Cotton roads are not, as one might suppose, roads built of cotton, but are bituminous roads built in the usual manner in all respects except that they contain a single layer of a loosely woven cotton fabric.

Reasons for Using Fabric

Two important considerations prompted the initial experimenting with cotton in road construction. There was the desire to find additional channels of distribution for a product that is of such vital importance to several of the southern states. There was also the desire to improve the serviceability of bituminous roads of the low-cost types by eliminating failures, retarding deterioration and reducing maintenance costs.

The most common failures in low-cost bituminous roads are raveling of the edges and failures caused by moisture. The edges of bituminous road surfaces, because they do not have good side support, are often inherently weak, and under the action of traffic break away, giving the road an unsightly appearance and at the same time narrowing its usable width. Edge failures are progressive and, if not repaired, will continue until the usable width is so narrow as to be a traffic hazard. It was thought that placing a strip of fabric along the edges might be of assistance in holding the mat together at its weakest point. Moisture failures are due primarily to water reaching the untreated base and softening it, thereby reducing its ability to support the bituminous-mat surface. When this occurs, the mat settles and cracks and becomes very rough. If not promptly repaired, the mat will gradually disintegrate and fail completely.

(*Continued on page 38*)

County Financing Of Illinois Roads

Interview with County Highway Superintendent Of St. Clair County

✦ THE HISTORY of the relationship between the State of Illinois and its counties in the construction and maintenance of the highways of the state shows constant evolution, with financial set-backs which fortunately have been ironed out. In 1913 the first road law was passed which permitted the counties to designate 25 per cent of their road mileage as state-aid roads, subject to the approval of the choice by the State Highway Department so that the roads would form an interconnecting system throughout the state. This was virtually a statewide arrangement similar to the Federal-Aid system for the nation. The improvement of this state-aid system was to be accomplished by the State Legislature appropriating a lump sum from the motor license fees collected, and which was to be apportioned among the several counties on the basis of population, road mileage and road and bridge levies, on the condition that the counties appropriate at least an equal amount, while construction was carried out under the direction of the State Highway Department.

In 1916 an additional 4,800 miles was added to the state highway system and a state bond issue for $60,000,000 passed which virtually wiped out the money that the counties had been receiving from the licenses as that money was set aside to pay off the bond issue. The roads designated as a basis for the $60,000,000 bond issue of 1916 were not additional to the state-aid system previously selected, but their general description was set forth in an act of the Legislature, the State Department of Public Works and Buildings having the right to fix the specific locations, which in many instances followed state-aid roads previously selected by the county, but not necessarily. This bond issue, while it pledged the full faith and claim of the State, by legislative enactment, became a first lien upon motor license fees. Under Section 15D, the counties were authorized to issue bonds after a county referendum, and to advance the State's share of the cost of improvement of state-aid roads, the county to be in charge of construction, but all plans and contracts to be subject to the approval of the State Department of Public Works and Buildings.

Up to 1921 all the money that the counties had to spend on road maintenance came from the general funds of the counties. In that year, however, an act was passed providing for the levying

(*Continued on page 44*)

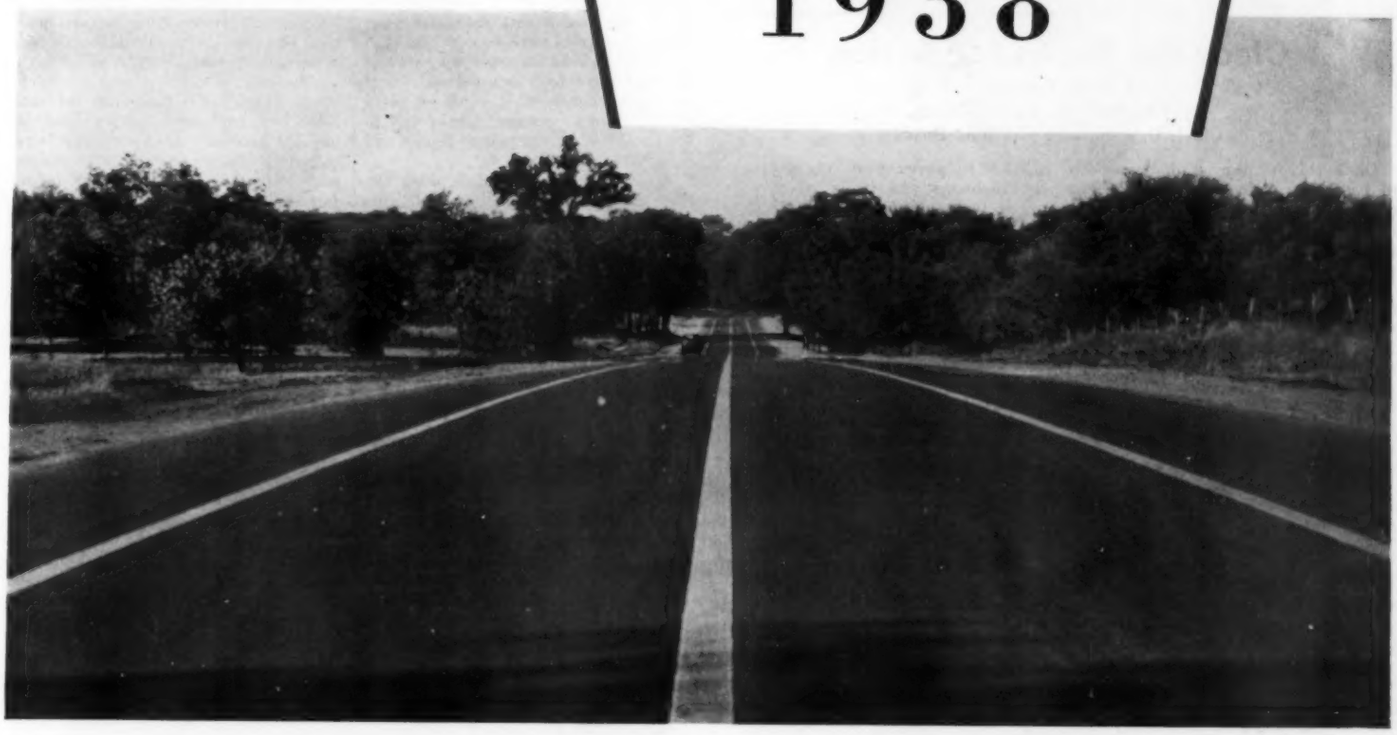
Distributers Cover the Fabric with an Application of Hot Bituminous Material

TEXACO

swings into

1938

A TEXACO Asphaltic Concrete Pavement on State Highway No. 1, Dallas Co., Texas.



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Clear the Decks for Action

A Guest Editorial
By THOMAS H. MacDONALD,
Chief, U. S. Bureau of Public Roads

On a ship of war at the approach of battle an order rings out: "Clear decks for action!" The normal ship's routine is halted; and all hands are pressed to the one supreme task of preparing for the crucial action to follow.

If it were practicable similarly to clear the highway decks for action and so to make urgently needed preparation for a future phase of highway development that will probably differ from past phases almost as greatly as the battle from the normal routine on shipboard, there are several preparatory efforts that I should regard as most essential.

I should place first the reestablishment of a satisfactory basis of cooperation in highway administration by the Federal, State and local governments. The former reasonable division of responsibility between them has been disturbed by the depression. A readjustment of their present emergency-generated relations is inevitable. The readjustment should be made only after due consideration of the respective abilities and appropriate responsibilities of the several orders of government and should be designed to last for a term of years. It is a purpose of the highway planning surveys, in progress in forty-five states, to supply the indisputable facts upon which alone such a general and lasting agreement can be reached. The survey's facts should be used promptly to this end.

Second in importance, as a measure of preparation to meet the more critical highway future, is a reestablishment of acceptable measures of taxation and finance. Despite benefits conferred by highway improvement upon land, resistance to payment of property taxes for highways has lately steadily reduced the yield of such taxes. It is time to give serious thought to means of supplying needed highway revenues if this resistance continues and the enlarged Federal contributions, that temporarily have made up the shortage, are decreased. If road-user payments are to be the principal support it is important to decide in what ways and in what proportions they are to be made by the various classes of users.

Costs of right-of-way will certainly enter more heavily into total highway expenses in the future. It is time to give thought to ways and means of meeting such costs, and to the associated problem of the revision of archaic and obstructive laws now governing the acquisition of land for highway purposes.

The lasting strength that only a stable subgrade can give will be essential if highway improvement is to be extended as widely as the demand for it calls for, and costs are to be kept within supportable limits. Contributing directly to this end, the already largely productive soil researches occupy another important place among the essential preparations for future action.

I should place these first among essential preparations necessary for sound highway progress. To further them, it is not necessary, as at the call of "clear the decks," to abandon all normal highway activities, but all those engaged in such activities—engineers, contractors, equipment manufacturers, material producers, and others—should recognize their prime importance, and, each in his own way, lend a hand.

A.R.B.A. Given Original Federal-Aid Road Bill

The original draft of the compromise Phelps-Dowell Bill passed by Congress in 1921, under which the United States Bureau of Public Roads is now spending Federal Aid for highway improvement, has been given to the library of the American Road Builders' Association. This draft was presented to the Association by M. O. Eldridge, who is at present Assistant Director of Vehicles and Traffic, Washington, D. C. As secretary of the Good Roads Board of the American Automobile Association in 1921, Mr. Eldridge was one of the three men who prepared this bill for the consideration of Congress. His associates were C. J. Adams, then Secretary to Senator Stanfield of Oregon, and Pyke Johnson, Secretary of the Good Roads Committee of the National Automobile Chamber of Commerce.

This bill, known as the Federal Highway Act, amended the Act of 1916, which provided that Federal funds might be appropriated to aid states in the construction of rural post roads. The 1921 Act created a Post Roads and Federal Highway Commission, and transferred to it all the powers relating to highways or public roads which had formerly been held by the Secretary of Agriculture and the National Defense Council. To this commission was given the authority to approve the highway projects that were to receive Federal Aid and it was provided that all Federal-Aid appropriations should be expended under this system. The bill provided for the appropriation of $100,000,000 to carry out these provisions during the fiscal year that ended June 30, 1922. It also set up the system to be followed in the apportionment of this Federal-Aid money.

The bill has been placed in the library of the American Road Builders' Association, at the University of Maryland, of which Dean S. S. Steinberg of the Engineering College is custodian.

Cape Cod Roads—Methods Used in 1908 and Today

To the Editor
CONTRACTORS AND ENGINEERS MONTHLY

Your editorial "Highway Tools Complete A Cycle" in the October issue of CONTRACTORS AND ENGINEERS MONTHLY interests me very much, particularly as you call attention to the fact that highway engineers are just beginning to use the disc harrow on road-mix work.

In the summer of 1908 I took a contract to build 2 miles of oil roads in South Orleans, Mass., along Pleasant Bay to Chatham, Mass. I think this was the first piece of oil road in this part of the country. On August 31, 1908, we started in grading the 2 miles of road which was just a cart path. In some places pine trees were so near the sand ruts that two vehicles could not pass and the sand was 6 to 8 inches deep. There was about 8,000 cubic yards of earth to be moved to get the right-of-way in shape. We had eight pair of horses and eight wheel scrapers.

After the job was graded, about October 8, the first car of oil arrived. This also was the first in these parts. After heating it for two or three days, we started to apply it. The job was about 7 miles from the Orleans railroad station where the oil was heated. The oil was hauled out to the job in an old wooden water cart owned by the city with a two-wheel trailer attached for spreading. This trailer had to be detached every time we turned around. About 2:30 that afternoon, we started to apply the oil but it was not hot enough and it just trickled out like cold molasses. The result was we had to keep going back and forth over a half-mile stretch until all the oil trickled out. The cart was wooden and we could not heat the oil again. We finally got rid of this load at 8:30, after six hours of hauling back and forth. The consequence was we had about half the asphalt on our hands, shoes, clothes and on the horses and the other half on the road.

We waited two days more until the oil in the car was hot enough and started out with two oil carts. In about a month we had applied three carloads of 8,000 gallons each to the road. Then we began to mix it in with a disc harrow, raked it and then rolled it with a ring roller and finally with a smooth roller. When it was all rolled we started in with the disc again and repeated the operation and kept this up until about Christmas. The next summer we went back and repeated the operation for about two months. Then we had a fairly good road for those times.

In 1911 I was elected Surveyor of Highways and in the spring of 1912 we bought what we called an oil outfit, consisting of a boiler to heat the oil, a pump to get it from the tank into the wagon, an oil wagon and a 3-ton roller. In the two or three years prior to that time, we had found a different way to build roads. First, we graded the road to proper width, which was then 15 feet, carted two-horse wagon-loads of sand and dumped it on either side of the road about 15 feet apart. Then the new oil outfit arrived and also a chap named George Pearson to show us how to operate the oil spreader. It worked fine and we applied about one gallon per square yard and had about ten men to throw sand on it. When it was well covered and rolled, we applied another gallon per square yard and repeated the operation. This is what we called the "layer method" of construction, and each year after that we built many miles of that type of road in Orleans until we had nearly every road covered. To give an idea of how much we did of this type of work in 1915 my notes show that we used 15 tank-car loads of 10,000 each. We stopped building this type of road about ten years ago and changed to bituminous concrete or hot-mix roads.

We will be glad to have you come down next summer and we will show you some of the roads built in 1912 to 1915 that have never had to be rebuilt yet.

ROLAND L. MAYO,
Surveyor of Highways

Orleans, Mass.
December 13, 1937

"The Boss Got That Way Cutting Bids Wherever He Could!"

Cancellation of F-A Rejected by Congress

By its adjournment without action on the President's recommendation to cancel the 1939 Federal-Aid funds for highway construction, Congress has definitely rejected the possibility of such action. Accordingly, as provided by law, the Secretary of Agriculture is required to allocate the regularly authorized 1939 Federal Aid on or before January 1. The failure of Congress to take action on the President's proposal makes it mandatory that the Federal-Aid funds, totalling $238,000,000, be apportioned in accordance with the Hayden-Cartwright Act of 1936.

The announcement that the Post Office and Post Roads Committee of the Senate, of which Senator Carl Hayden is the ranking member, turned down the President's recommendation, and that Chairman Wilburn Cartwright of the House Committee on Roads repeatedly expressed his unalterable opposition to the proposal, indicates that the recommendation was considered economically unsound.

The entire highway industry and profession may well feel gratified that the needs of our transportation system and the economic facts were sufficiently well known, for which the American Road Builders' Association and other organizations throughout the country interested in better roads are to a large extent responsible, to prevent any reduction or cancellation of Federal highway appropriations at this time.

German Autobahnen Lower Driving Costs

A recent experiment has been carried out in Germany to demonstrate the greater economy possible through the use of the Motor Roads—Reichsautobahnen—as compared with the ordinary highways. These experiments were made by the General Inspector of German Highways on a stretch of the Reichsautobahn and a parallel ordinary highway between Bad Nauheim and Bruchsal. The length of the Motor Road was 147 kilometers and that of the ordinary highway 161 kilometers. The results registered were as follows:

	For ordinary highway	For Reichsautobahn
Running time	2 hr. 16 min.	1 hr. 14 min.
Gear shifts	105	4
Brakes used, times	100	3
Movement of steering wheel	360 meters	2.10 meters

Fuel consumption, 17 liters per 100 kilometers at average speed of 70 kilometers an hour, 30-40 per cent saving by use of Autobahn.

A similar experiment with a 6.5-ton diesel truck with trailer and 8 tons dead load showed fuel consumption of 33.4 liters via Autobahn against 48.2 liters via ordinary highway. Information furnished by the Bureau of Foreign and Domestic Commerce.

A Freeze Preventive

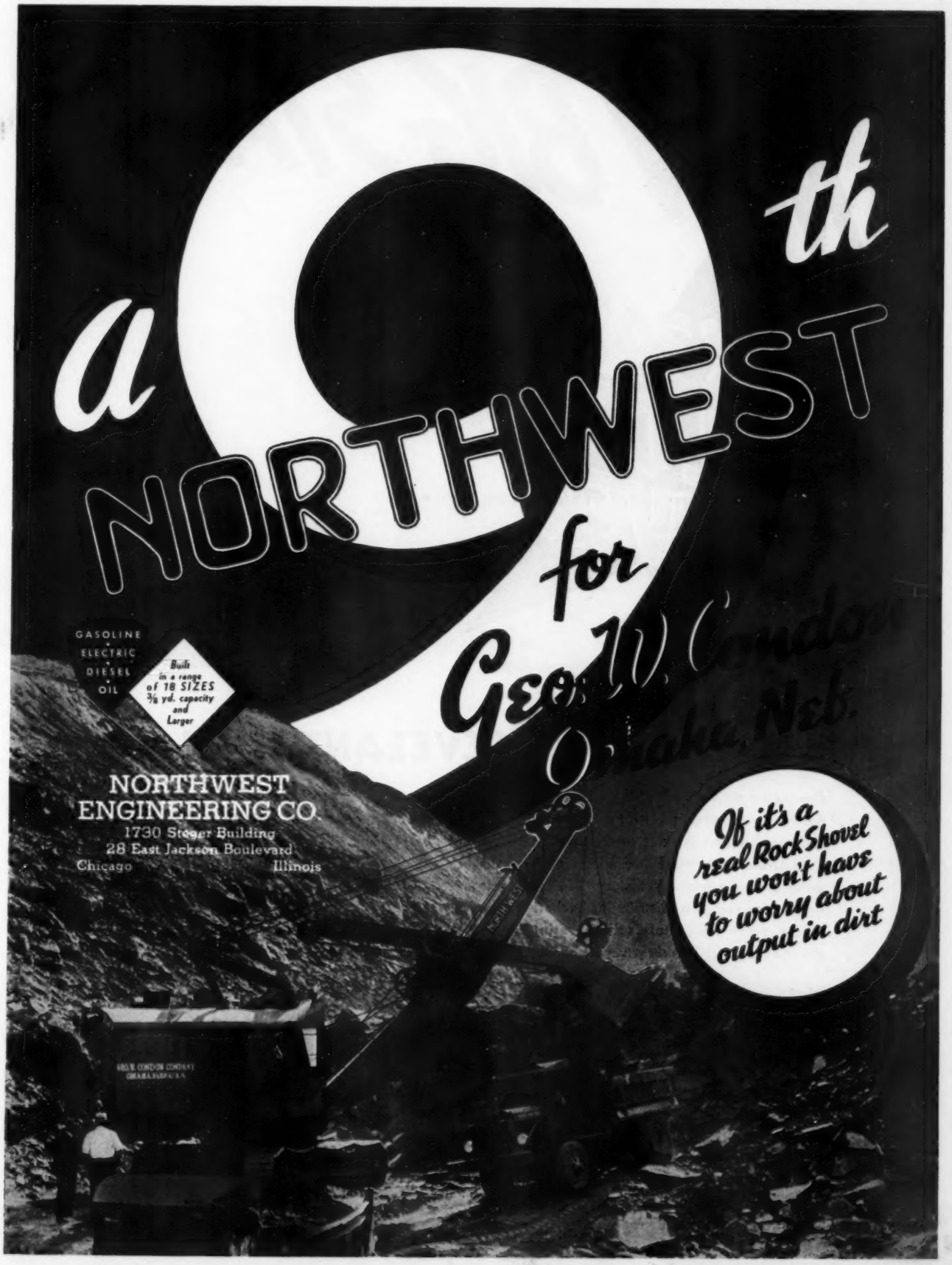
A new system to prevent freezing of air lines and air tools during winter weather has been announced by Sullivan Machinery Co., Michigan City, Ind., to supplement Tanner gas which has been used successfully for some time on construction and other operations employing pneumatic equipment.

The new preventive is known as Frosto and may be used wherever electric current is available for its operation. Frosto is vaporized electrically and fed into the compressed air line near the compressor as fast as necessary to prevent freezing of water vapor in the compressed air lines and tools. About one quart of Frosto is required to treat 100,000 cubic feet of free air under the worst conditions of temperature and humidity, according to the latest bulletin on Frosto and Tanner gas freeze preventive systems, which may be secured from Sullivan Machinery Co.

New Jersey Highway Plans

State Highway Commissioner E. Donald Sterner of New Jersey announced on Oct. 15, 1937, that it was estimated there would be available in the year 1938 from motor vehicle and gas tax funds of the state approximately $11,042,469.30 for the purpose of construction of state highways. The anticipated revenue of the state highway fund in the year 1938 for all purposes was estimated to be $47,056,000 as compared with $47,327,000 during 1937. The estimated income for 1938 includes motor vehicle fees, $19,800,000; gas taxes, $21,350,000; Federal Aid, $1,700,000; and miscellaneous revenue, $200,000. An additional bond issue of $3,421,000 is requested to aid the construction of new bridges over the Passaic and Raritan Rivers.

Mandatory expenditure from the state highway funds for 1938 includes: debt service, $12,794,451.20; aid to counties, $6.735,000; aid to townships, $2,835,000.



Highway Dept. Aids School Traffic Studies

An enterprising woman teacher in Staples High School, Staples, Minn., is supervising 100 history and economics students in a thorough study of the state's new traffic code recently issued by the Minnesota Highway Department. Appalled by the horrible waste of life on our streets and highways and aware of the part that modern transportation mediums had come to play in the life of every individual, this teacher intends that her pupils, all present or future highway users, will know the traffic laws and why they have been enacted and realize that diligence in observing them will help solve one of the greatest problems of the modern era, that of safety on our highways.

The *Staples World*, cooperating in this innovation, will award pen and pencil sets to the five students receiving the highest marks in an examination at the termination of this extracurricular study. Staples High School is using the pocket-sized traffic law booklets furnished free by the Minnesota Highway Department. It would be well for more schools to contribute to the future safety of our highways in this manner and for more states to prepare understandable booklets on their traffic laws and safe driving for distribution to those schools which would use them in similar courses of study.

Excavating Equipment

A new 32-page booklet, describing and illustrating Koehring excavating equipment and depicting this equipment on a variety of work, as well as showing the various mechanical features of the equipment, has recently been issued by the Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis. This complete line of shovels, cranes and draglines, with gasoline, diesel or electric power, includes sizes and types to meet the various excavating problems on all kinds of construction jobs.

Copies of this Catalog No. 678 may be secured by those interested direct from the manufacturer.

The NEW BIG STARS OF T

REX 34E DUAL DRUM PAVER

SEE THEM IN CLEVELAND—JAN. 17-21!

Dominating the Road Show! The Rex Exhibit will be the center of attraction, with contractors, engineers and road builders flocking to see the new 34-E Rex Dual Drum Paver—the streamlined paver that will make paving machinery history. It's NEW—from its charging skip to its distributing bucket! It's faster, bigger, more completely self-operating than any paver ever built! It is *the* paver for 1938!

The road show premier of the Rex 160! See the concrete pump that in eight short months has set performance records never before approached by any placement method—the new portable 160 Pumpcrete! Introduced only last June, it has been used by many contractors in building viaducts, culverts, bridges, overpasses, warehouses and homes. Its adaptability to any job setup is now proved by facts—and known to contractors from Maine to California!

REX PAVER

CHAIN BELT COMPANY O

International Builds Larger Tractor Works

A $1,000,000 addition to the tractor works of the International Harvester Co., at 2600 W. 31st Boulevard, Chicago, Ill., is now under way. This enlarged plant will be devoted entirely to the production of the International line of TracTracTor crawler-type tractors as distinguished from wheel-type tractors. Five different-size models will be produced in the enlarged plant, including two models powered by diesel motors. The diesel engines will continue to be made at the company's plant at Milwaukee.

TracTracTor machining and assembling operations will be conducted in the new space with the assembly line lengthened to 500 feet and its present output of 40 crawler tractors per day increased to 75. Railroad tracks will adjoin the north end of the new structure and an electric crane having a 58-foot span will operate over the entire loading area. It is expected that the new plant will be completed by May 1.

Quarry Plant Bulletin And Another on Screens

Bulletin D-37-A on portable quarry plants with Diamond portable crushers and folding bucket elevators, all mounted on a sturdy wheeled base for easy transportation, has recently been issued by Diamond Iron Works, Inc., Minneapolis, Minn. This company has also issued Bulletin D-37-B on Diamond roller bearing vibrator screens with complete dimension data for single, double and triple deck vibrator screens.

New Half-Yard Shovel Faster and More Powerful

The General Excavator Co., Marion, Ohio, manufacturer of power excavating machinery, will unveil a new ½-yard heavy-duty excavator at its booth No. A-3 at the Road Show in Cleveland on January 17. This new machine, in keeping with the modern trend, features lighter weight, more power and more speed, but without sacrifice of stamina.

Increased line speeds, swing speed and two travel speeds are obtained through new and unusual design features. At the same time certain fundamental and time-tested features of General Excavator design have been retained, such as the use of unit steel castings wherever their use seems to be desirable and advantageous. The truck-frame casting and the side-frame castings, while still being of cast steel, are made stronger and yet lighter in weight.

The final drive is by double roller drive chains, and steering is controlled by means of friction bands. The main frame for the upper body is also a unit steel casting and carries all of the operating machinery in alignment on machined pads. Friction is reduced through the extensive use of roller and ball bearings. The gears controlling the swing and travel motions are enclosed and run in an oil bath, while disc-type friction clutches control the direction of rotation of the gears.

This machine is available as a shovel, dragline, pullshovel, clamshell or crane and each is readily convertible to the other type. The shovel boom is of all-steel welded construction with all-steel welded box-section dipper handle. The crowding motion is transmitted through a heavy crowding chain, and is so designed that the retract motion is twice the speed of the crowding motion, giving plenty of power for crowding and lots of speed for moving dirt. The boom is adjustable to any digging angle without the necessity of making an adjustment in the crowding chain. The dipper is a full ½-yard capacity bucket.

A special feature of this new excavator is the boom hoist which is of the worm and wheel type with an automatic brake for double safety. It is operated through an auxiliary clutch which is also used for the shovel retract motion.

In crane work the boom is operated through the auxiliary friction clutch, making it live and entirely independent of the swing and travel motions. The boom is of the tubular, latticed type, of all-welded construction. All operating machinery is fully enclosed in a modern cab affording plenty of room for operation and servicing.

Chevrolet 1938 Trucks

The line of Chevrolet trucks for 1938 comprises a wide selection of models on six different chassis, designed to meet many varying needs. The new ¾-ton and 1-ton series recently introduced to meet the demand for trucks of intermediate capacity are continued for 1938.

The entire line of trucks produced by the Chevrolet Motor Division, General Motors Sales Corp., Detroit, Michigan, has undergone extensive improvement through engineering refinements. Outstanding among mechanical improvements is the new diaphragm-type clutch, providing softer yet more positive engagement, greater operating ease, and increased durability with lighter weight.

The ¾-ton and 1-ton series each includes pick-up, stake and panel models and both are built on chassis having a wheelbase of 122¼ inches. The 1½-ton series, powered for full heavy-duty operation, has a 131½-inch and a 157-inch wheelbase. Improved truck engine rear mountings are also featured in this 1938 series.

Road Roller Pressure Demonstrated at Show

By mounting a standard 10-ton Hercules road roller with an Ironeroll on scales at its exhibit at the 1938 Road Show of the American Road Builders' Association at Cleveland, Ohio, The Hercules Co., Marion, Ohio, will demonstrate the compaction effected by the front and rear rolls as well as by the Ironeroll. This exhibit, in charge of Carl G. A. Schmidt, Jr., Sales Manager of the company, will show definitely and graphically how this auxiliary roll can be used to exert variable pressures on a highway surface to iron out waves, wrinkles and other road irregularities.

Motor Truck Facts

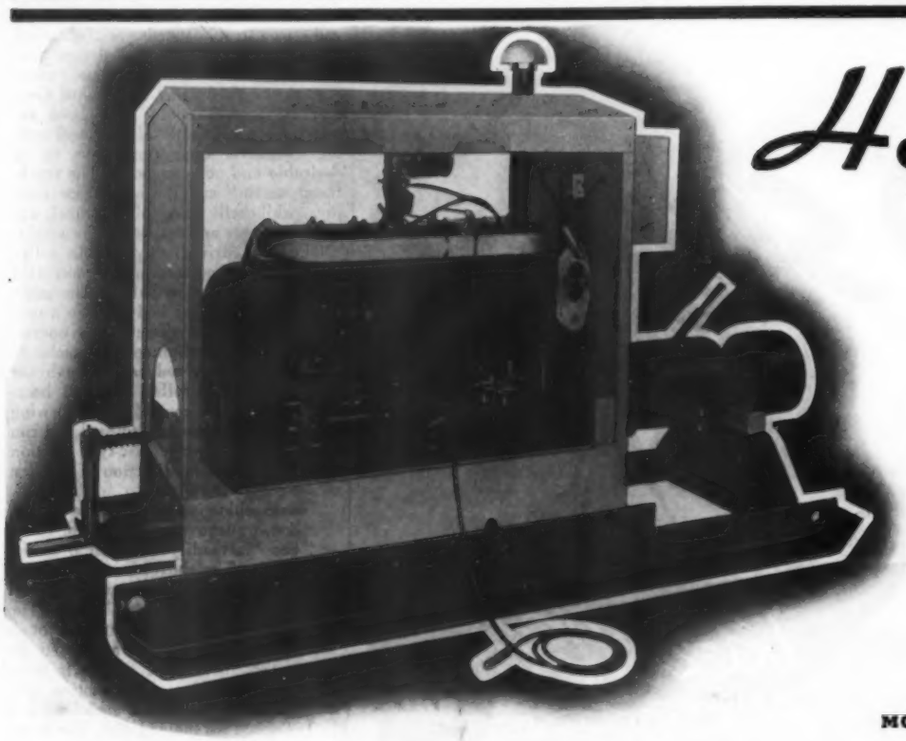
The 1937 edition of "Motor Truck Facts," issued annually by the Automobile Manufacturers Association, Inc., has just been published. This book contains the usual statistics on motor trucks for the year 1936 and shows some interesting conclusions.

For example, the registrations of motor trucks have reached a new high of 4,023,606 vehicles. The annual tax bill of motor truck owners, excluding that which is paid in personal property taxes on trucks in operation, income and property taxes on garages, etc., totals $383,563,000, an amount which it is estimated would build 10,000 miles of first-class roads.

Single free copies of "Motor Truck Facts" may be secured from the Automobile Manufacturers Association, Inc., 366 Madison Ave., New York City.

A. H. & D. Co. Announces New Manager of Sales

American Hoist & Derrick Co., St. Paul, Minn., has announced the appointment of Stanley M. Hunter as Manager of Sales. Mr. Hunter has been associated with this company for the last two years.



Here is rugged dependable power that sets a new low in operating and maintenance cost . . . . .

MODEL P-61

Franklin AIRCOOLED

INDUSTRIAL POWER UNITS

Whether your problem is one of power for industrial equipment, road machinery, agricultural machinery, oil field equipment, trucks, compressors, pumps, or any other heavy duty power application, consider Franklin AIRCOOLED'S inherent reliability in relation to your own power needs. ¶ Give this husky Franklin AIRCOOLED Power Unit a thorough going-over. Examine its simple, rugged construction and easy-access design . . . its lighter weight . . . its individual cylinder construction which cuts costly servicing delays. Check its mechanical features for quality, efficiency, longer life. ¶ Ask owners to tell you how manifold vaporization control, elimination of condensation at the valve ports, efficient valve-in-head combustion chamber, superior manifold design, proper control of manifold heat and the use of aluminum alloy pistons have enabled them to save up to 30% on gasoline alone. ¶ Ask them to show you how they've cut maintenance costs as much as 50% through the elimination of radiator, hose, water pump and fan belt troubles . . . how they have overcome freezing and corrosion problems. ¶ Translate these cost-saving advantages in terms of your own operating dollars. Doesn't it become apparent that Franklin AIRCOOLED power has a definite place in your power picture? We will welcome an opportunity to *prove* that it has. **Write for Bulletin 6E.**

Top. A Model P-61 Power Unit providing sawmill power in New York State . . . *Below.* A model 160 Davey Compressor powered with a Franklin AIRCOOLED Model 6A-400 Engine. Operating in Southern California in 125° above zero at 7000 feet elevation.

SEE THESE FRANKLIN AIRCOOLED POWER UNITS *at the Cleveland* ROAD SHOW

SPACE B-36. NEW EXHIBITION HALL

Franklin AIRCOOLED Power Units are made in 6 models covering a wide range of heavy duty applications requiring from 30 to 180 HP.

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Savings in Road Costs Through Soils Studies

Advance Studies of Soils Save in Yardage of Base Gravel, and Give More Uniform Bearing in Fills

By F. C. LANG, Engineer of Tests, Inspection and Research, Minnesota Department of Highways

✦ THERE is at the present time a widespread interest in low-cost roads, for our highway systems can not be satisfactorily completed until a suitable low-cost road is developed for at least the secondary and third-class systems. The general conception of a low-cost road is low construction or initial cost, and consequently maintenance or subsequent costs are likely to be overlooked. The reason for the high maintenance costs is usually due to inadequate foundation support for a flexible surface. If foundations are of adequate strength for the traffic load, it is not difficult to build and maintain at low cost a dustless waterproof surface which will satisfactorily withstand the abrasion of modern pneumatic-tired traffic. Inexpensive foundations cannot be built unless they are made mostly from the natural soil materials which are along or close to the road.

The load on a flexible surface is transmitted to the foundation and subgrade over a rather small area. There is at present no established mathematical method for computing just what is the intensity of the pressure at any point in the base or subgrade under rapidly moving loads. There is, likewise, no established method for measuring or evaluating the supporting power of flexible bases such as gravel. The supporting power varies with the type and density of the soil and the moisture content, the latter changing with the weather and the seasons. Until satisfactory methods for analyzing and computing the supporting power of flexible bases and subgrades are developed, engineers must depend on observation and experience. Much can be learned from a study of the large mileage of such roads which have been built. During the past 5 years considerable attention has been given to the construction of low-cost stabilized gravel and stone bases, and some attention has been given to the selection and manipulation of the natural soils in the grades. Impetus has been given to base construction by the fact that some industries saw opportunities to increase the use of their products. The selection and manipulation of the soils to make better subgrades appear to be fundamentally sound and have received favorable attention from engineers.

Some progress in scientific low-cost road construction has been made in Minnesota. Until the past few years, it was the general practice to design and construct the road so as to get the lowest earth-work cost per cubic yard and per mile for a suitable grade and alignment. This meant balancing cuts and fills and keeping overhaul to a minimum. The excavated material was placed in that part of the fill where it could be placed at the least cost. After the grade was completed, gravel was placed over the road to a uniform depth for the entire length of the project. Care was taken to see that the gravel pits were stripped and as a result the gravel hauled to the road was clean, containing little binder.

Soil Studies Save Base Gravel

Our first step in determining the necessary thickness of gravel foundations was a survey of the low-cost bituminous roads by soils engineers. In this survey, made during the spring break-up, they observed the thickness of compacted gravel bases under the light bituminous treatments which were satisfactorily supporting traffic over various subgrade conditions. Where failure occurred, it was usually quite apparent that the road was unsatisfactory because of localized sections of weakness. The study included an examination of the gravel base and the underlying soil. As a result of these studies, the soils engineers on later construction recommended varying the thickness of the gravel base along a road according to conditions of the subgrade so as to get more nearly a uniform support for the bituminous surface. This resulted in a considerable saving over the former method of building the base of equal thickness over the entire project. The latter method meant either that a considerable distance would have a thicker base than was necessary, or that the weaker sections would fail and have to be repaired. The first of these would increase the construction costs, while the second would materially increase the maintenance and vehicle operating costs.

While there can be no question concerning the ultimate economy of obtaining a base of uniform supporting power during construction, it is difficult to state just what the savings would amount to at the time of construction. They would vary according to the changes of subgrade condition and how adequately the gravel base carried the traffic over the weaker subgrades. On one particular project 12½ miles in length, the gravel base thickness was changed twenty-five times as follows:

1 section	0 thickness	4.36 miles
10 sections	2" thickness	2.96 miles
10 sections	6" thickness	4.39 miles
4 sections	9" thickness	0.83 miles

(*Continued on page* 30)

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WELL POINT SYSTEMS
WILL DRY UP ANY EXCAVATION
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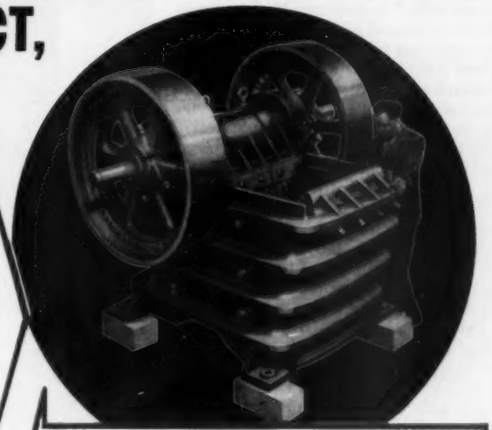
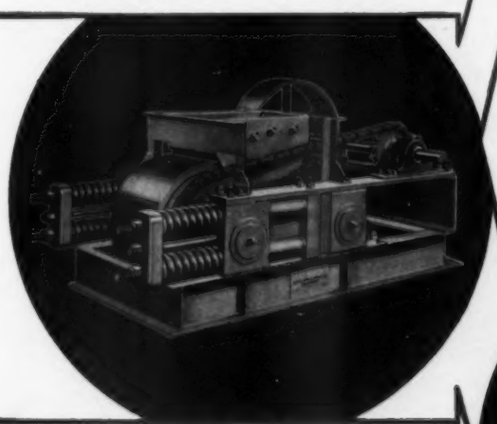
LONG LIFE, LOW UP-KEEP EQUIPMENT
BETTERS THE PRODUCT, LOWERS THE COST



TELSMITH - WHEELING JAW CRUSHER
This super-strong, all-steel force feed jaw crusher gives greater reduction in one process than any other type of breaker. Cylindrical roller bearings and higher speed almost double capacity without any greater expenditure for power. Two toggle settings and simple adjustment allow wide range of product sizing. Made in seven sizes. *Write for Bulletin W-34.*
FOR COARSE CRUSHING



TELSMITH DOUBLE ROLL CRUSHER
Telsmith's latest contribution to secondary crushing is this double roll crusher, designed for quantity production of fine aggregate at moderate reduction ratios. The Telsmith Roll Crusher requires little headroom and is economical in first cost. Anti-friction bearings running in oil and spring release insure continuous operation free of break-downs. *Write for Bulletin L-34.*
FOR SECONDARY CRUSHING

TELSMITH PULSATOR
This heavy-duty vibrating screen handles sand, gravel, crushed rock, ore or coal *efficiently*, wet or dry. Maximum screening action, uniform on every inch of wire, on every deck, under any load. Anti-friction bearings and special sealing devices to protect working parts insure long life and low up-keep. Made in eleven sizes in single, double, or triple deck. *Write for Bulletin V-34.*
FOR UNIFORM SCREENING

Associates in Canada: Canadian Vickers, Limited Montreal and Vancouver

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211 W. Wacker Drive Chicago, Ill.
1013 Commercial Trust Bldg. Philadelphia, Pa.
81 Binney St. Cambridge, Mass.
412 Westinghouse Bldg. Pittsburgh, Pa.
Brandeis M. & S. Co. Louisville, Ky.

MC-7-38
SMITH ENGINEERING WORKS, 4014 N. HOLTON ST., MILWAUKEE, WIS.

An Austin-Western No. 99 Motor Grader at Work on an Oil-Mix Job in Wisconsin

New Model Motor Grader In Construction Class

The new model motor grader just announced by the Austin-Western Road Machinery Co., Aurora, Ill., and to be formally displayed for the first time at the Cleveland Road Show has numerous features which take it out of the "maintainer class" and places it distinctly in the "construction class." The turning radius has been shortened and the maneuverability and traction of the machine increased, without increasing the existing standards of weight or power.

The outstanding features of the machine are that power is applied to all wheels, and steering is through the front and rear wheels whereby traction can be controlled to increase blade output. The conventional idling front wheels are not used, but in their place are power-driven front wheels which are the same diameter as the rear drivers. The machine is equipped with but four wheels, but each of them drives and steers. Either single or dual tires may be used. Every adjustment in the operation of the machine is controlled hydraulically, including front and rear steering, extending or retracting the working blade without disturbing the position of the circle or "floor plane" of the road, raising the blade and scarifier and any other required adjustment.

This New Model 99 is furnished with either gas or diesel motors and optional tire equipment. The standard moldboard is 13 feet long. The extra traction and steerability of this machine, according to Austin-Western, enables it to handle a blade of this length on the severest work. The scarifier folds up out of the way to avoid the windrow or load carried by the blade. The machine can be fitted with special attachments such as a bulldozer, backsloper, snow plow, and wings.

New Line of Trailers

A new line of heavy-duty heavy-machinery and material trailers has been announced by the La Crosse Trailer & Equipment Co., La Crosse, Wis. These include the Model TA, an 8-wheel heavy-duty reversible trailer with pneumatic tires in capacities of 23, 28 and 33 tons; the Model KU 6-wheel unit, also equipped with pneumatic tires, in 18, 25 and 32-ton capacities; the Model KU with 4 wheels and capacities of 11, 16 and 21 tons; the Model DF 12-wheel unit for extra heavy jobs, equipped with solid or pneumatic tires and available in capacities of 33, 36, 40, 42 and 50 tons; the Model LC reversible 8-wheel unit with solid or pneumatic tires and capacities ranging from 21 to 49 tons; and the Model SP 8-wheel general-purpose trailer on which solid and pneumatic-tire wheels are interchangeable and which is available in 22 and 24-ton models.

On all of these trailers, the gross load is limited to the tire capacity. Loading skids, lash rings and safety chains are furnished as standard equipment and power brakes are available if desired. Special lengths, heights or widths are also available at extra cost.

Complete information on these trailers which are designed to meet the variety of transportation problems of contractors may be secured direct from the manufacturer by mentioning this magazine.

Heating Water for Winter Construction

When a contractor is up against producing concrete after the air temperature gets down below 40 degrees, he needs a water heater which will produce large volumes of hot water, as well as some method of heating his aggregate. The new Aeroil double-coil water heater, No. 47, raises 700 gallons of water per hour from 50 degrees F. to 180 degrees F., or 800 gallons to 150 degrees F. The high speed and large volume in water heating is made possible by the use of a double-coil system containing over 150 feet of steel pipe in a series of double coils, which offer a maximum of heating surface to the 2,000-degree heat delivered by the burner. In addition to the double coils, Aeroil Burner Co., Inc., Park Ave. at 13th St., West New York, N. J., has built into this heater a series of heat deflectors or baffle plates which force the heated air in and out of the coils to utilize all of the heat energy possible.

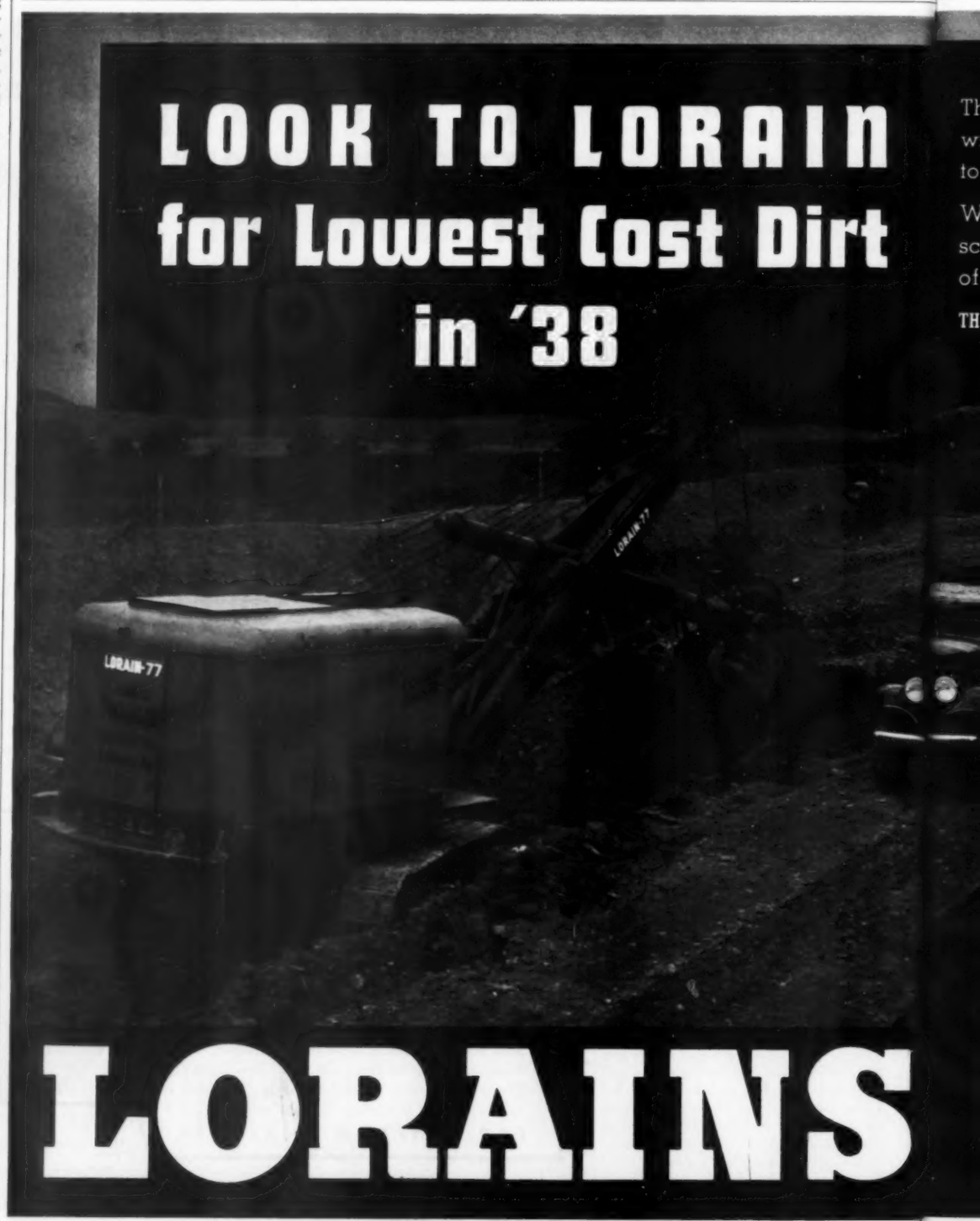
The New Aeroil Double-Coil Water Heater for Winter Concreting

The manufacturer states that the fuel consumption does not run above 8 gallons, and usually averages about 6 gallons, per hour. The most efficient type of fuel to use in the burner is kerosene or light furnace oil. A new heavy-duty Aeroil No. 4 oversized burner was developed for this water heater, and a 30-gallon fuel tank is supplied with it.

A complete description of this new high-capacity water heater with full specifications and price will be found in leaflet No. 315, which may be secured direct from Aeroil Burner Co. by mentioning this magazine.

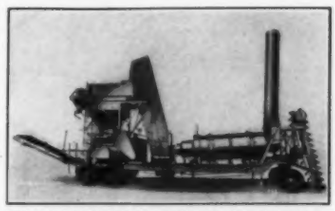
New Distributors Of Ransome Mixers

The Ransome Concrete Machinery Co., Dunellen, N. J., maker of concrete mixers, has announced the appointment of three new agencies for the complete Ransome line of concrete mixing, paving and handling machinery: Milburn Machinery Co., 1057 West Goodale Blvd., Columbus, Ohio; Graham B. Bright, 914 Grace-American Bldg., Richmond, Va.; and Engleby Equipment Co., 108 Albermarle Ave., S. E., Roanoke, Va.



Smaller Portable Plant For Hot-Mix Operations

The new Cedar Rapids Speedline hot-mix asphalt plant, announced by the Iowa Manufacturing Co., Cedar Rapids, Iowa, at the Road Show in Cleveland, is designed for bituminous construction involving contracts that cannot be handled economically by the larger hot asphalt plants. The plant is claimed to have the same efficiency, accuracy and control as found in the larger stationary plants and is complete with cold elevator, hot blast heavy-duty drier, hot elevator, a Cedar Rapids-Symons horizontal vibrating screen, compartment storage bin, asphalt buckets, aggregate and asphalt-weighing scales, aggregate hopper, asphalt pump, twin shafted 1,000-pound capacity pugmill and V-belt drives from a single power unit. All of these units are mounted on one truck chassis which is supported by dual pneumatic tires, making the plant completely portable. Necessary accessory equipment not included and which is usually furnished by the contractor includes a steam boiler, asphalt and fuel oil storage tank, and the necessary yard piping.



The New Iowa Speedline Hot-Mix Plant

These plants have been trailed at from 20 to 30 miles per hour over the road, and are made in either the full trailer or semi-trailer type. The drier burners are made to use road oil if desired. Only 75 to 85-hp is required for the operation of the complete plant which can be moved from place to place without freight charges.

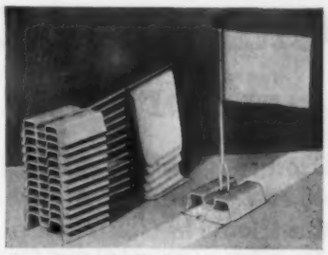
An attractive circular on this plant will be sent on request by the Iowa Mfg. Co. to those interested and who mention CONTRACTORS AND ENGINEERS MONTHLY when writing.

Truck Speeds Forward And Back Now Same

The Fuller Mfg. Co. of Kalamazoo, Mich., is now producing a new reversing auxiliary which allows the use of the complete range of gear ratios provided by the regular truck transmission for forward movement to be used in reverse. This unit is particularly useful in shuttle operations since it enables the vehicle to travel in either direction at the same speeds.

The unit is made in two styles, an amidship type and a unit type, with the clutch housing and clutch release parts to mount directly on the engine. An interesting feature of this auxiliary is that it is convertible by a simple exchange of gears from a reverse box to an efficient 2-speed auxiliary.

This goes for rock or dirt with any Lorain from 3/8 to 2 cu. yd.
Write for catalogs describing this modern line of shovels and cranes.
THE THEW SHOVEL COMPANY
LORAIN, OHIO
2 YD.
3/4 YD.
1 1/2 YD.
1/2 YD.
TRUCK CRANE
THEW CENTER DRIVE



General Guards Nested for Storage and in Use Straddling a Traffic Line

Guarding Wet Paint On Traffic Lines

All kinds of methods are used by different states, counties and cities to keep the motorists off the wet paint of newly applied traffic lines. General Road Equipment Co., Hanna Bldg., Cleveland, Ohio, has devised the General Traffic Line Guard which has a red flag mounted on a steel flagstaff with a slip collar to support the flag at the mast, and a removable staff cap for easy handling and convenience in renewing the flag. The steel flag staff is mounted on a steel base which has a simple flat spring for holding the flagstaff in upright position, or laid down for transportation.

These guards span the line so that half as many are needed to protect the same amount of lines.

Lincoln Tunnel Under Hudson River Dedicated

(*Photo on page* 56)

The first or south tube of the Lincoln vehicular tunnel under the Hudson River, connecting Weehawken, N. J., with Midtown Manhattan, was dedicated on December 21, 1937, and opened to traffic on December 22. This first tube accommodates one lane of traffic traveling in each direction until the north or second tube is completed in 1941, when each tube will carry one-way traffic.

The south tube just opened measures 8,215 feet in length, 4,600 feet of which is under the river. There are two 21½-foot lane roadways, with a 13-foot operating headroom clearance. The general external diameter of cast iron and steel shell which forms the tube under the river is 31 feet and the maximum depth from the river surface to the top of the tunnel is 75 feet. Three ventilation buildings with a total of 32 fans insure a continuous flow of fresh air through the tunnel. The Port of New York Authority estimates that a crossing from portal to portal can be made in four minutes.

A PWA grant of $4,700,000 was made to the Port of New York Authority to finance the $42,000,000 south tube and a grant of $3,100,000 and an extension of credit of $26,000,000 has been made by the PWA for the completion of the north tube. This tunnel will connect with the proposed tunnel under Manhattan and the Queens Midtown tunnel under construction under the East River.

Data on Jaw Crushers And Swing Hammer Types

Day Pulverizer Co., Inc., Knoxville, Tenn., manufacturer of crushing and pulverizing machinery exclusively since 1914, has just issued a new series of bulletins on Day jaw and swing hammer crushers as well as semi-portable and traveling crushers.

Bulletin 884 describes the Day 10 x 20 roller-bearing crusher, mounted on skids or on trucks with a folding elevator bucket. Bulletin 957 describes the 9 x 16 jaw crusher which is mounted on skids, or as a semi-portable or a traveling crusher. Another 8-page bulletin describes the crushers and swing hammer pulverizers.

Clamshell Dredges Work in Atchafalaya

Dredge Conical Moved 48,760 Yards a Month On Item I, Contract of Sternberg Dredging Co.

✦ THE HARDEST part of the work on Item I of the Bayou Sorrel-Bayou Long levee in 1937 was assigned to the clamshell dredge Conical by its owner, Sternberg Dredging Co. of St. Louis, Mo. The first step in the construction of this levee was the building of a retaining dike on the river side 100 feet from the center line of the levee by a dipper dredge; then the Grand Lake, described in full in a later article of this series, placed the second part of the levee, really the first lift; and the Conical completed the levee in two lifts. The Conical averaged 48,760 cubic yards a month in material consisting of 85 per cent clay, 5 per cent sand and 10 per cent other material.

The material for the retaining dike was removed from a river-side borrow pit 115 to 130 feet from the center line of the levee and placed in the dike between 90 and 115 feet from the center line of the levee. The material placed by the hydraulic dredge Grand Lake was taken from a river-side borrow pit 215 to 400 feet from the center line and at a maximum depth of 18 feet. The two lifts of the Conical were from pits 215 to 405 and 215 to 428 feet from the center line and of maximum depths of 22 and 27 feet respectively. On the last lift some of the material was rehandled to the initial river-side borrow pit to fill violated pits which the contractor is allowed during construction for his convenience and at his own risk.

The levee had a typical section with a 10-foot crown and 1 on 5.5 slopes both land and river side. There were several points where false berms were introduced into the section in widths varying from 100 feet land side and 60 feet river side, at 7 and 9 feet below net grade respectively, to 150 feet land side and 100 feet river side at 6 and 8 feet below net grade respectively. There was also one section with an 80-foot land-side and a 40-foot river-side false berm at 8 and 10 feet below net grade respectively. The levee averaged about 18 feet high with an 8 per cent allowance for shrinkage for material placed hydraulically and 25 per cent for material placed by clamshell.

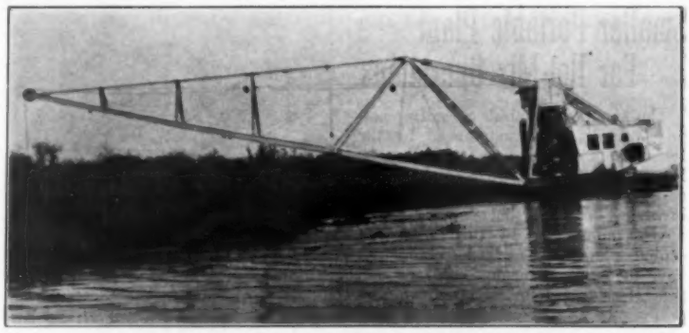
The Dredge Conical

The dredge Conical received its name from the large truncated cone which supports the boom and counterweight, giving the unit a distinctive appearance. The hull of the dredge is all steel, measuring 150 feet long, 50 feet wide and 9 feet deep, carrying three spuds of welded steel construction. The dredge is moved ahead by using the bucket as an anchor and pulling ahead with the tag line. A steadying pontoon is attached to the hull. The supporting cone is of ½-inch steel plate 62 feet high, 30 feet diameter at the bottom, 10 feet diameter at the top and rising 53 feet above the deck. The cone is reinforced with a central I-beam and upright channels laid back to back against the cone from bottom to top. Additional bracing is furnished by cross members. The base of the cone is fastened to four girders about 30 feet long set at right angles to each other and welded to the bottom of the barge.

The entire frame consisting of the boom and counterbalance is hung on the top of the cone on nineteen conical bearings rolling on two machined surfaces and floating in oil. To prevent lateral motion, the top of the cone is built with a portion of the frame overlapping it, forming another bearing also covered with oil.

The main engine of the Conical is a Busch Sulzer 1,000-hp 2-cycle, air-injection diesel engine. It is direct-connected to a 225-kw direct-current generator, and drives a 200-kw direct-current generator and a 319-kva alternating-current generator by means of thirty-six 1-inch rubber-composition V-belts. The direct current supplies power to the

(Continued on page 49)



This Clamshell Dredge Conical, Shown Depositing Material into the Levee on the Sternberg Contract, Is an Example of the Advances in Engineering Design Developed in the Progress of Flood Control Work on the Lower Mississippi

TO-DAY
CONCRETE ROAD PATCHES
Opened To Traffic In 3 Hours

No more closed roads, red lights, barricades, etc., waiting for old-fashioned cast concrete patches to harden. Use the new principle of Vibrated Concrete and open your road to traffic in three hours after completion of patch. Several states are taking advantage of this—making stronger patches—using less cement.

Try a patch this way at our expense. We shall be glad to demonstrate this method on your roads, upon receipt of written request.

The International Vibration Company
16782 Waterloo Road Cleveland, Ohio

THANKS TO YOU
COUNTY ENGINEERS

. . . And contractors who have demanded a LeTourneau Carryall Scraper in a smaller size . . . cheaper in price . . . incorporating all the job-proved features and rugged construction that have made them the standard the world over. The results have exceeded all expectations . . . here it is . . . The Scraper that fits the purse and purpose, the

G-6 CARRYALL SCRAPER

THE G-6 will do everything the larger LeTourneau Carryalls will do . . . is cable controlled . . . with *double* cable action: one operating the apron to a high lift position, the other the bowl. This action allows positive load control in all kinds of materials . . . and furnishes *independent positive ejection* . . . the bowl is self-cleaning . . . will spread its load in measured, accurate layers from 1" to 14". As with all Carryalls, the G-6 will draw in its own slope . . . will cut a ditch or back slope. A new standard of economy, too, is established; the "Caterpillar" D6 is the running mate for this 6-Yard Scraper, yet the G-6 is rugged enough to stay right with larger tractors. See it at the Road Show . . . or see your "Caterpillar" dealer for further details.

R. G. LeTOURNEAU, Inc.
Peoria, Illinois Stockton, California
Cable Address: "Bobletorno"

Manufacturers of: Angledozers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Treedozers.

*Name registered U. S. Patent Office.

LETOURNEAU

U.S.B.P.R. Reports Progress On Inter-American Highway

In its recent report on the work of the U. S. Bureau of Public Roads for the fiscal year ending June 30, 1937, the Bureau states that work on the Inter-American Highway from the United States to Panama has continued at increased speed during the past year. Impassable gaps have been reduced to 560 miles and these will be closed as rapidly as local funds can be supplied to carry on the work.

Under cooperative arrangements with three of the Central American republics, materials, machinery and technical direction are being supplied by the United States for the construction of eleven bridges and labor and local materials are being supplied by the countries concerned. Engineers of the Bureau are supervising the location and building of sections of the route in Costa Rica, Nicaragua and Guatemala.

The total length of the highway will be 3,250 miles. At present there are 1,265 miles of all-weather roads, 1,425 miles of dry-season roads and 560 miles of trails impassable to wheeled vehicles.

Link-Belt Appointments

Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., has announced several changes in the personnel of its management and sales organization. Harold L. Hoefman has been appointed Manager of the Link-Belt plant, warehouse and sales office at Atlanta, Ga., to succeed the late I. H. Barbee; George A. Paige has been appointed Manager of the Link-Belt warehouse and sales office in Detroit; Laurance O. Millard has been appointed District Sales Manager at Pittsburgh and Paul V. Wheeler has been appointed District Sales Manager at Cleveland.

Jahn Plant Moves

The C. R. Jahn Co., manufacturer of heavy-duty and single-purpose trailers for moving construction equipment, has announced its removal to new and larger plant quarters at 1345 West 37th Place, Chicago. Present facilities provide for complete control of assembly and shipment with inside rail loadings. The general sales offices are still located at 228 N. La Salle Street, Chicago.

. . . but a "CATERPILLAR" DIESEL'S work *is never done!*

YOU KNOW the old saying about man's work. Nowadays, it ought to run: ". . . but a Diesel's work is never done." And here are two pictures to prove it! Both were snapped in precisely the same spot in Box Elder County, Utah.

Throughout the open months, a "Caterpillar" Diesel Auto Patrol devotes its days to scarifying, blading and ditching. But that's merely warm-up work for a "Caterpillar" Diesel. In winter, it puts on a V-type plow and thinks nothing of clearing 40 to 50 miles of snow a day; consuming only 12 gallons of 8-cent fuel.

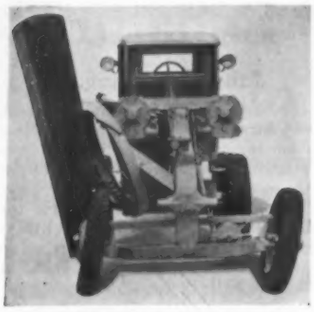
There's never a moment—night or day, all year round—when a "Caterpillar" Diesel Auto Patrol can't be doing a useful job. Its low-pressure tires, on tandem drive . . . and its ideally placed engine . . . give it traction and weight for heavy drifts and for heavy ditching. Federal, County, City and State Governments (as well as foreign countries) have proved its versatility, economy and durability. The more a "Caterpillar" Auto Patrol does for them, the more they ask it to do. *And it always delivers!* That's why its work is never done.

● **AT THE 1938 NATIONAL ROAD SHOW,** the Caterpillar Tractor Co. and Allied Equipment Manufacturers will have all of the main floor of the Cleveland Auditorium. 45 pieces of the latest, most modern road-building machinery on display—*and in action.* (Almost a quarter-million dollars' worth of equipment!) Something doing all the time, on the main floor. *Make it your headquarters.*

CATERPILLAR

TRACTOR CO., PEORIA, ILL.

DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY



An Adams Heavy-Duty Grader with Blade In the Back-Sloping Position

Motor Grader Does High Back-Sloping

At its Road Show exhibit in Cleveland this month, J. D. Adams Co., Indianapolis, Ind., will show the latest high-lift models of Adams leaning-wheel graders, the Adams heavy-duty motor grader with a 62-hp diesel engine, and the new No. 20 Adams motor grader with a 22½-hp engine, a low-priced model recently introduced for town and township maintenance.

A high spot of the exhibit will be the almost continuous demonstration of how Adams heavy-duty motor graders can be used for building roads from ditch to ditch, including the cutting of high back slopes. This is a new development of Adams of particular interest to state and county highway officials who would like to use motor graders for ditch building and ditch cleaning as well as for surface construction and maintenance.

It is claimed that such back-sloping positions as that illustrated, and other wide-range blade positions obtainable with these machines, is made possible by the narrow, box-type frame which allows a much freer and wider range movement of the blade-lift linkage than is possible with the conventional 2-member frame. This type of frame was introduced in Adams leaning-wheel graders three years ago.

New Chief Engr. for Novo

George W. Stevens, who for the past two and a half years has been Engineering and Sales Representative for the Novo Engine Co., of Lansing, Mich., in the Southwest, has been appointed Chief Engineer of that company. Mr. Stevens has had considerable experience in the design and engineering of engines and in specialized equipment for oil fields and is a member of the American Society of Mechanical Engineers.

New Excavator Models Have Many New Features

The new models of Bay City excavators which will be exhibited at the Road Show in Cleveland include a Model-25 ½-yard shovel with 16-inch crawler shoes and powered with an International Harvester 6-cylinder gasoline engine; a Model 45 heavy-duty ¾-yard full-revolving shovel, equipped as a trench hoe, and powered with a Hercules 6-cylinder gasoline engine; a Bay City ½-yard dragline bucket; and a Model-32 ⅝-yard full-revolving shovel powered with an International Harvester PD-40 diesel engine.

Features of all new models of Bay City shovels include a slightly streamlined cab design providing increased vision for the operator and equipped with safety glass; drop-forged crawler shoes; all-electric-welded crawler frame construction; new design in booms and sticks, all electric welded with drop-forged dipper teeth; ball-bearing sheaves throughout the machinery and boom point, including permanent lubricated ball bearings in many locations; and splined construction for all shafting.

A complete line of new-design new-style trench-hoe attachments for all models and sizes, a complete line of deck trailers, up to 25-tons in capacity, and general purpose dragline buckets in capacities of ⅜ to 1 cubic yards are now available.

Complete information on any or all of these models may be secured direct from Bay City Shovels, Inc., Bay City, Mich., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

ESTABLISHED 1854

SHUNK GRADER BLADES

Highest Quality Blades or Cutting Edges for Graders . . . Patrols . . . Maintainers . . . Scrapers . . . Fresno, Wheeled, Slip, Buck and Rotary Scrapers . . . Backfillers . . . Bulldozers . . . Snow Plows . . . Trailbuilders . . . Trailblazers . . . Roadbuilders . . . Backslopers . . . Road Drags . . . Extensions, etc.

WE CAN FURNISH BLADES FOR ANY MACHINE ON THE MARKET. Shunk Blades are uniform in quality and give longer wear.

We can also furnish Wearing Boots and Moldboards and superior quality Scarifier and Rooter Teeth.

SHUNK MANUFACTURING COMPANY, Bucyrus, Ohio

BUYING A HOIST?

JAEGER Ball Bearing HOISTS up to 100 H.P. Offer . . .

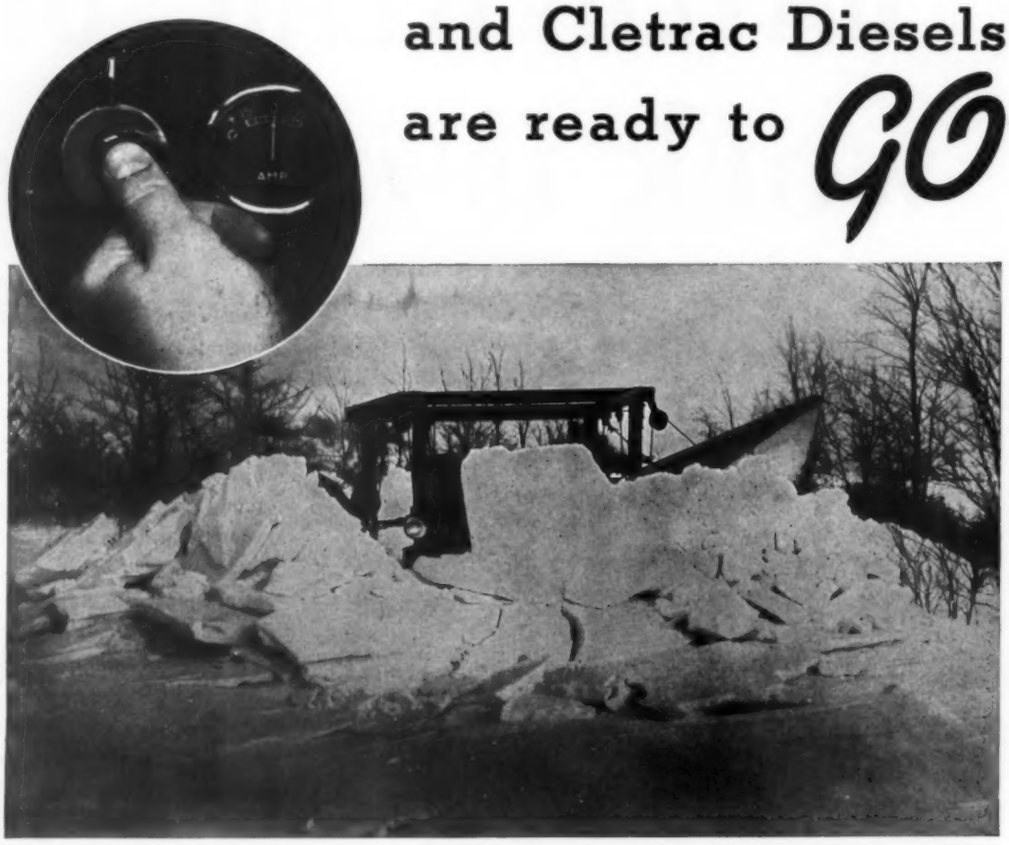
- Finger-Tip Hoist Control (same as on $12,000 Shovels)
- Finest Double-Row, Self-Aligning Bearings,
- Machined, Balanced Drums
- Silent Chain Drive, Compounding Brakes, etc. 1, 2 or 3 drums (Interchangeable), Gas or Electric.

Get our low prices on light 10-20 H. P. and intermediate 25 H. P. Screw Thrust Hoists. Send for Catalog H-37.

THE JAEGER MACHINE CO.
701 Dublin Ave. Columbus, Ohio

JAEGER

A touch on the electric starter and Cletrac Diesels are ready to GO



Left out all night at the cross-road in temperatures 20 to 30 degrees below zero, this Cletrac Diesel in New York State started with ease . . . at a touch of the electric starter button . . . just like your automobile.

All Cletrac Diesels, as well as the larger gasoline models, have electric starting—modern starting. There's no waiting to get on the job . . . no hand cranking of an auxiliary engine . . . just a touch of the button. The result is time saved . . . labor saved . . . delays eliminated . . . less idling time.

But electric starting is only one advantage of a Cletrac Diesel Tractor. With the controlled differential steering, an exclusive Cletrac feature, it is easier to balance the load and the tractor . . . the Cletrac does a better job of winging back the snow . . . it gets more miles cleaned in a day's time . . . it is easier on the operator . . . and both tracks are under power at all times.

Check all the advantages of the Cletrac. You'll find many reasons why more and more of the world's work is being done with Cletracs . . . why you'll want to own them, too. There's a size for every job . . . from 22 to 94 horsepower and with either gasoline or Diesel engines.

What's your job? Do it easier, better, more economically with a Cletrac.

THE CLEVELAND TRACTOR COMPANY, CLEVELAND, OHIO
San Francisco Branch: 2660 Harrison Street • Distributors in more than 125 principal cities

CLETRAC CRAWLER TRACTORS
The only tractors with controlled differential steering that keeps both tracks pulling at all times . . . on the turn as well as on the straightaway.

An 18-Mile Road-Mix Job In Arkansas

Dense Graded Aggregate And RC2C Asphalt Used On El Dorado-Strong Road in 1937

✦ A SECTION of highway was built during the hot summer of 1937 by the Arkansas Highway Department to determine the advantages, if any, of an RC2C asphalt as a binder for the dense graded aggregate, pit-run gravel, found in southern Arkansas. During 1937 the State Highway Department carried on an intensive program south and east of Little Rock in the construction of these dense graded aggregate roads, and is making every effort to determine the best combination of asphalt and aggregate which will permit the laying of the largest mileage of bituminous road surface with the funds and time available.

The El Dorado-Strong job was a one-course machine-mixed job on a 6-inch compacted gravel base. Following the spreading and rolling of the gravel base and its further compaction under traffic with constant blading to insure a uniform layer of gravel, the base was primed with MC-1 asphalt for 7.2 miles at the rate of 0.7 gallon per square yard for the full 22 feet of the base, and with MC-2 for 10.6 miles, at an average rate of 0.55 gallon.

Road-Mix Base Course

The dense graded aggregate was then spread at the rate of 250 pounds per square yard, giving a 2½-inch layer 20 feet wide when spread. This was placed in a windrow and bladed back and forth across the road until it was dried under the hot sun to less than 2 per cent moisture. Then it was windrowed close to the right-hand side of the road for the Barber-Green mixer.

The Barber-Green machine, a new unit with a capacity of 1¼ yards of material mixed per minute and with the pug mill mounted about 8 feet above the ground, was used to pick up the windrow of dried aggregate, elevate it to the measuring device and then again to the mixer where it was shot with 4.2 per cent of the RC2C asphalt having a penetration of 140, mixed and run to the ground in a windrow. The elevation of the pug mill makes this machine particularly adaptable to other work as it can be used easily as a stationary plant for the mixing of material, delivering directly to trucks.

The asphalt used is a combination of a medium-cure base asphalt with a rapid-cure solvent. In order to secure the greatest possible progress this job was pushed 12 hours a day seven days a week when weather permitted, and "wet grounds" always meant a shut-down.

The mix was laid down in a windrow one day and then turned over across the road by blades, using a Caterpillar patrol, the following day to a windrow on the other side of the road. The next day it was bladed back and forth across the road until not more than 8 per cent solvent remained, determined by field laboratory tests. This turning operation was carried into the fourth day when drying conditions were apparently good and longer when conditions were unfavorable. The material was then spread. The reason for leaving the material in a windrow when bladed across the road was two-fold. First, if the material were left spread across the road for more rapid curing, some traffic would inevitably run onto it and cause compaction that could not be worked out when the material was bladed again the next day; thus there would be a non-uniform material for the final spreading. Second, in case of rain during the night, a windrow is better for shedding the rain than a wide layer of road-mix. It is more difficult to dry out water in a road-mix job than is the curing of the material for the release of the solvent. After the spreading of the material it was rolled with a 5-ton 3-wheel roller for placing, and full compaction secured with a 12-ton 3-wheel roller.

The operation of this job was very economical because the road mixer required only an operator and an oiler, who also handled the asphalt connections from the supply trucks to the mixer tank. The machine was driven by a LeRoi engine and the asphalt heating equipment was furnished by Littleford.

The job was completed under the direction of M. C. Methwin, District Engineer of the Arkansas State Highway Commission, with the asphalt operations in the charge of W. E. Conley, Supervisor.

C. & E. M. Photo
This Road-Mixer Picks Up, Mixes and Windrows 1¼ Yards of Material a Minute

Rogers Trailers for 1938 . . . embodying well proven, fundamental features of Rogers design . . . engineered from tip to tail . . . completely electric welded . . . electric steel castings through out . . . mounted on pneumatic tires . . . equipped with an original system of equalizing brakes.

These features combine to give a stronger but lighter trailer that hauls more easily at lower cost . . . that is under absolute control at all times regardless of road or load conditions.

There are types and sizes of Rogers Trailers for all needs reflecting essential knowledge gained by years of specialization. Look up these latest developments of the pioneer trailer builders at the Cleveland road show . . . see the new braking system in action . . . or write for the latest Rogers catalog.

"Experience Built It
Performance Sold It"

ROGERS BROTHERS CORPORATION
108 Orchard Street
Albion, Penna.
Builders of **LOW BED** *and* **GIRDER TYPE HEAVY DUTY TRAILERS** *Exclusively*

One of the New Lorain Shovels, Showing Its New Torsional Member Feature

Shovel Features New Torsional Member

Among the new improvements and developments in excavating equipment is the new shovel boom recently developed by The Thew Shovel Co., Lorain, Ohio, for use on its 1½-yard Lorain 77 and 1¼-yard Lorain 75-D. The design of this boom is based on an actual analysis of the torsional stresses which occur in a shovel boom. The boom is literally two booms in one, a structural member which absorbs all bending and compression stresses, and a torsional member which absorbs and resists all boom-twisting stresses. Each member is connected independently to the shipper shaft and boom hinges in such a way that no torsional stresses can pass through the structural member and no bending stresses can be transmitted to or through the torsional member.

The structural side members of the boom are fabricated of plates and alloy steel angles riveted and electric welded into a plate girder construction. These members act as a beam and absorb all boom-bending and compression stresses. These members are fish belly in shape with the deepest and strongest section at the center at the shipper shaft or point of maximum stress.

The torsional member extends from the shipper shaft to the boom hinges. It is a seamless tube about 11 inches in diameter, fastened to the shipper shaft by means of a cast steel U-shaped yoke. The yoke absorbs the shipper shaft torsional stresses and transmits them into the tubular torsion member, which in turn transmits them to the base of the boom where they are transmitted into the boom foot hinges by a cast steel crosshead. The torsional member is connected to the yoke and crosshead by electric welding.

A New Portable Saw With Electric Drive

A new 7-inch portable electric saw with a 2⅜-inch maximum depth of cut particularly adaptable for handling all of the cuts necessary for form work has been announced by Black & Decker Mfg. Co., Towson, Md. The manufacturer calls attention to the motor power which has been increased to double that of former comparable models and is transmitted by worm gears to deliver maximum power at the blade. A fan and large vent slots provide for cool motor operation. The close-coupled design has reduced the weight and length of this saw and the new saw-grip switch handle and front handle facilitate the use of this tool.

In addition to the adjustable depth of cut, the saw table may be tilted for angle and bevel cutting and locked at any angle from zero to 45 degrees. The unit is provided with a detachable, adjustable rip-fence, which measures and guides rip cutting up to 6 inches wide. A sight notch at the front of the saw table makes it easy to follow a pencil mark or other guide. Variable types of blades and abrasive discs are available, adapting this tool to rip sawing, crosscutting, metal cutting, sawing marble, asbestos, Transite tile and porcelain.

The safety features of the saw include a telescoping guard which covers the blade at all times except when actually cutting. The inner guard, mounted on ball bearings, opens as the saw advances into the work and springs closed the instant the cut is finished. The outer guard swivels on a single housing to follow the depth-of-cut adjustment. A two-fold, instant release switch mounted inside the grip avoids accidental turning on and cuts off immediately when the operator's grasp is released. The net weight of this saw is 17¾ pounds.

Pages 55-A and 55-B of the new Black & Decker Mfg. Co. catalog describe this saw in detail. Copies will be sent to readers free on request by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Start 1938 RIGHT WITH WARCO EQUIPMENT

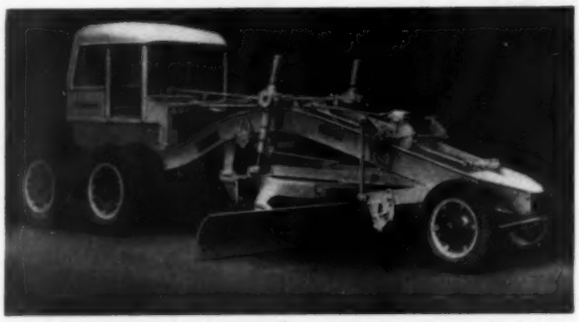
★ FLEXIBLE

A heavy duty Blade Grader, completely power controlled, with maximum strength, Visibility, and Range of Blade, wheel and axle movements.

★ VARIABLE

Quick and easy transportation from job to job, as well as conventional speeds and compression while rolling.

★ VERSATILE



WARCO Streamline Power Controlled Heavy Duty Model 33 or 35, powered with either Diesel or Gas, will solve your Motor Grader problem.

★ POWERFUL

WARCO reliable Heavy Model H Center Control, for the extensive construction job, has enabled many contractors to cut their costs.

Don't miss seeing these machines at the ARBA Road Show. Space C-34.

W. A. RIDDELL CORPORATION

PIONEER BUILDERS OF ONE MAN GRADERS

GEN. OFFICE & FACTORY BUCYRUS, OHIO

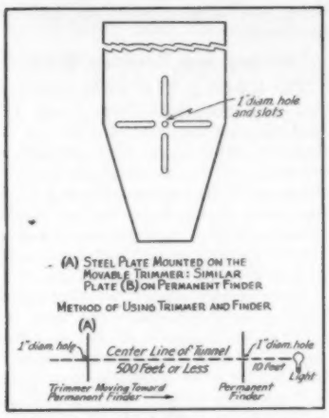

1" diam. hole and slots
(A) Steel Plate Mounted on the Movable Trimmer: Similar Plate (B) on Permanent Finder
Method of Using Trimmer and Finder
(A)
1" diam. hole
Center Line of Tunnel
500 Feet or Less
1" diam. hole
10 Feet
Light
Trimmer Moving Toward Permanent Finder
Permanent Finder

Diagram of the Trimmer Range Finder and How It Is Used

Unusual Machine Used To Trim Roza Tunnels

(*Continued from page 2*)

a 7/16-inch hole to represent the center of the tunnel. There are also four slots above and below and to the sides of the hole to aid in lining up. This range finder can be seen, in the picture, at the center of the arch and just above the plank staging and is also shown in the diagram above.

To keep the trimmer centered in the tunnel, the procedure is as follows. A similar range finder is set up permanently in the exact center of the tunnel and 500 feet ahead of the movable trimmer at each set-up. This is a similar plate with right-angle slots and center hole. Ten feet in advance of the permanent finder, and also in the exact center of the tunnel, a bulb from a flashlight is mounted.

As the trimmer proceeds through the tunnel toward the stationary finder and light, the operator sights through the hole in his finder and if he can see the light through the hole in the forward finder, the three points are then in line and he knows that the trimmer is centered. If, due to the sidewise or vertical irregularities of the track on which the trimmer runs, he cannot see the light, he then brings the trimmer into line by manipulating it horizontally or vertically by means of three adjusting screws on long crankshafts centered near his position, as seen in the illustration on page 2. These screws at angles to one another give him all the latitude of adjustment needed.

Improvements Suggested In Plate Girder Design

The Committee on Technical Research of the American Institute of Steel Construction at the recent convention of the Institute made a number of interesting recommendations, among them the question of the design of plate girders. The Committee points out that plate girder design methods are not lacking but the trouble is that there are too many of them. All of the refinements which for theoretical reasons have led to this, that and the other rule for girder design have resulted in girders which were alike within a very few per cent, and most of which were probably heavier than need be.

The latest Institute specification gives an extremely simple rule, designing for gross moment of inertia in all usual cases. The Committee on Specifications adopted this rule on the basis of general experience and not on the basis of any series of tests aimed at this particular problem. While the service testing of girders has been of enormous proportions, the laboratory testing has been meager. A modest program has been initiated at Columbia University and Swarthmore College to fill in the gaps and incidentally to give a check on the Institute Specifications. Some very consistent and satisfactory data were obtained during the past college term, and a progress report is in preparation, while the work itself is now being resumed.

AMERICAN CONCRETE EXPANSION JOINT CO.

221 N. LA SALLE ST., CHICAGO, ILL.

ACE-JOINTS

THE HEART OF THE HIGHWAY

J-BARS

CLEVELAND ROAD SHOW

BOOTH D48

STERLING BALANCED WHEELBARROWS

GREATER PART OF LOAD BALANCED OVER WHEEL. LESS THAN 20% ON ARMS.

NO. S12—FOR DRY MATERIALS

NO. S18—FOR CONCRETE

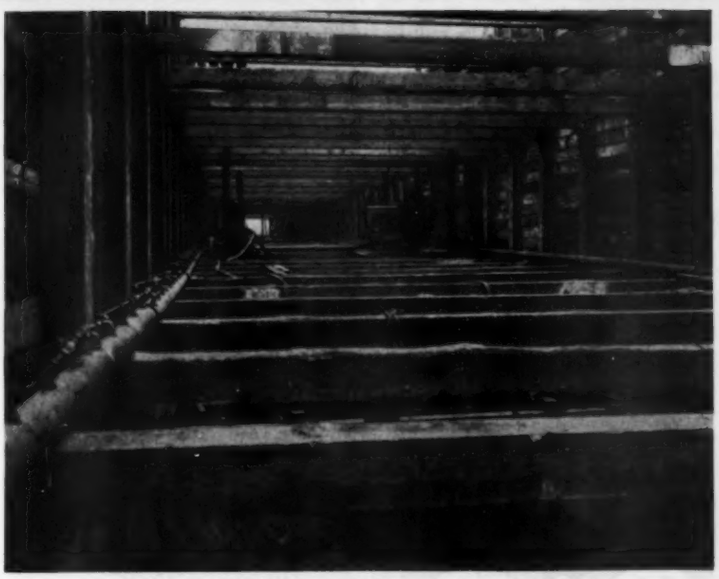
A COMPLETE LINE OF STERLING WHEELBARROWS AND CONCRETE CARTS.

STERLING WHEELBARROW CO., MILWAUKEE, WIS.

Goodbye water — THEY INSTALLED A

GRIFFIN WELLPOINT SYSTEM

A FEW MAJOR JOBS DE-WATERED IN 1937



A 28-FOOT DIAMETER, $1,000,000 SEWER CONTRACT, ADJACENT TO THE NEW YORK WORLD'S FAIR 1939, BOROUGH QUEENS, N. Y.

* TULLY & DI NAPOLI, INC., LONG ISLAND CITY, N. Y., CONTRACTORS

POWER HOUSE CONTRACTS:

* OWEN-AMES-KIMBALL CO., Grand Rapids, Michigan
* JEROME A. UTLEY, Detroit, Michigan
* THOMAS O'CONNOR CO. Boston, Mass.

BUILDING CONTRACTS:

FORD MOTOR COMPANY
Frankini Const. Co., Medford, Mass.

BURROUGHS ADDING MACHINE COMPANY
Esslinger-Misch Co., Detroit, Mich.

SHEFFIELD FARMS MILK DEPOT
Geo. J. Atwell Foundation Corp., N. Y. C.

BRIDGE CONTRACTS:

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MERRITT-CHAPMAN-SCOTT CORP.
New York, N. Y.

Port Huron, Mich., to Sarnia, Canada
THE MISSOURI VALLEY BRIDGE & IRON CO.
Leavenworth, Kansas

Allegheny River-Pittsburgh, Pa.
* HOLMES CONSTRUCTION CO.
Wooster, Ohio

SEWER CONTRACTS:

* ARTHUR A. JOHNSON CO. & NECARO CO., INC., Long Island City, N. Y.

OLIVER J. TRUDEAU,
Detroit, Mich.

* Now working in the dry. Other contracts completed.

Write for Catalog—Estimates—Job Layouts—No Obligation

GRIFFIN WELLPOINT CORPORATION

Rentals 725 East 140th St., New York *Sales*

Mud-Pump Nipples Built Into Road

Bonnet Carré Spillway Approach Fill Highway Prepared for Settling At "Bottomless Hole"

✦ WHEN the north approach fill for the highway bridge across the flowway section at the Bonnet Carré spillway above New Orleans was started in 1932, popular opinion credited the open water which it crossed as being a "bottomless hole." (C&EM, September, 1935, page 5.) The contractor succeeded in building a fill which has carried traffic for several years without serious settlement. However, when the contract for the new concrete pavement was let in 1937, the plans called for a total of 1,416 mud-pump connections to be set in the two 21-foot slabs so that, should settlement occur at any time in the future, it could be corrected promptly by Mud Jacks forcing the concrete pavement back to grade.

The contractor, Doullut & Ewin of New Orleans, considered several methods of installing the 2½-inch mud-pump nipple connections and finally chose the simplest method. Each 8-inch nipple was filled with the hanging moss that is so common on the live oaks in the South and which, because of its resiliency, is used extensively for pillows, mattresses and upholstery after soaking and curing. The nipples, plugged with the moss, were driven through the concrete slab to the subgrade immediately behind the finishing machine so that the only work done around them was the hand finishing. The driving compacted the moss slightly so that there was usually about 1 inch of concrete in the bottom of each nipple.

On the following day the moss was pulled out, using small hooks and even hand augers when necessary, and the plug of concrete at the bottom was driven down and out of the way with a bar and sledge. The nipples were filled to within 2 inches of the top with mud and sealed off with asphalt. The spacing of the nipples was staggered, with the first row having four across, the first 30 inches from the outside of the slab and the others 60 inches on centers. The next row, 5 feet distant, had the first nipple 60 inches from the outside, the second 50 inches away and the third 62 inches away.

Final Grading

As the grade for the highway slab had been completed for some time and used for traffic it was necessary only to cut the proper amount for the concrete. This was done with four 2-mule team slip scrapers which also worked on the shoulders. The grade was compacted with a Huber 10-ton gasoline-powered roller. The final cutting of the grade to the proper cross section was done with a Lakewood subgrader.

Seven men worked on the hand cutting of the form trenches for the 8-inch Blaw-Knox steel forms with 8-inch base. A form-setter and one helper set all the forms, followed by a form liner and three men tamping under the base of the forms.

C. & E. M. Photo

A Sledge or an Auger Was Used to Clean the Mud-Pump Connections

Pouring and Finishing Slabs

The Koehring 27-E paver pulled a Ted Carr subgrader from which six men shoveled the excess dirt as it accumulated. This same crew pushed a scratch-board for the final checking of the grade before the concrete was placed. The paver timing device was set for 67 seconds for the 1-minute mix to allow for the time required for the materials to flow from the skip to the drum.

Between the paver and the actual pouring of the concrete two men set the Truscon center steel and the steel for the dummy and expansion joints. The former were spaced 30 feet apart and the latter 90 feet. The slab had an 8-7-8-inch section with a parabolic crown for the top and bottom carried for 7 feet from the outer edge and a tangent for the balance of the section.

Five puddlers handled the spreading of the concrete after the paver operator

(*Continued on page* 50)

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15 Models of Electric Vibrators
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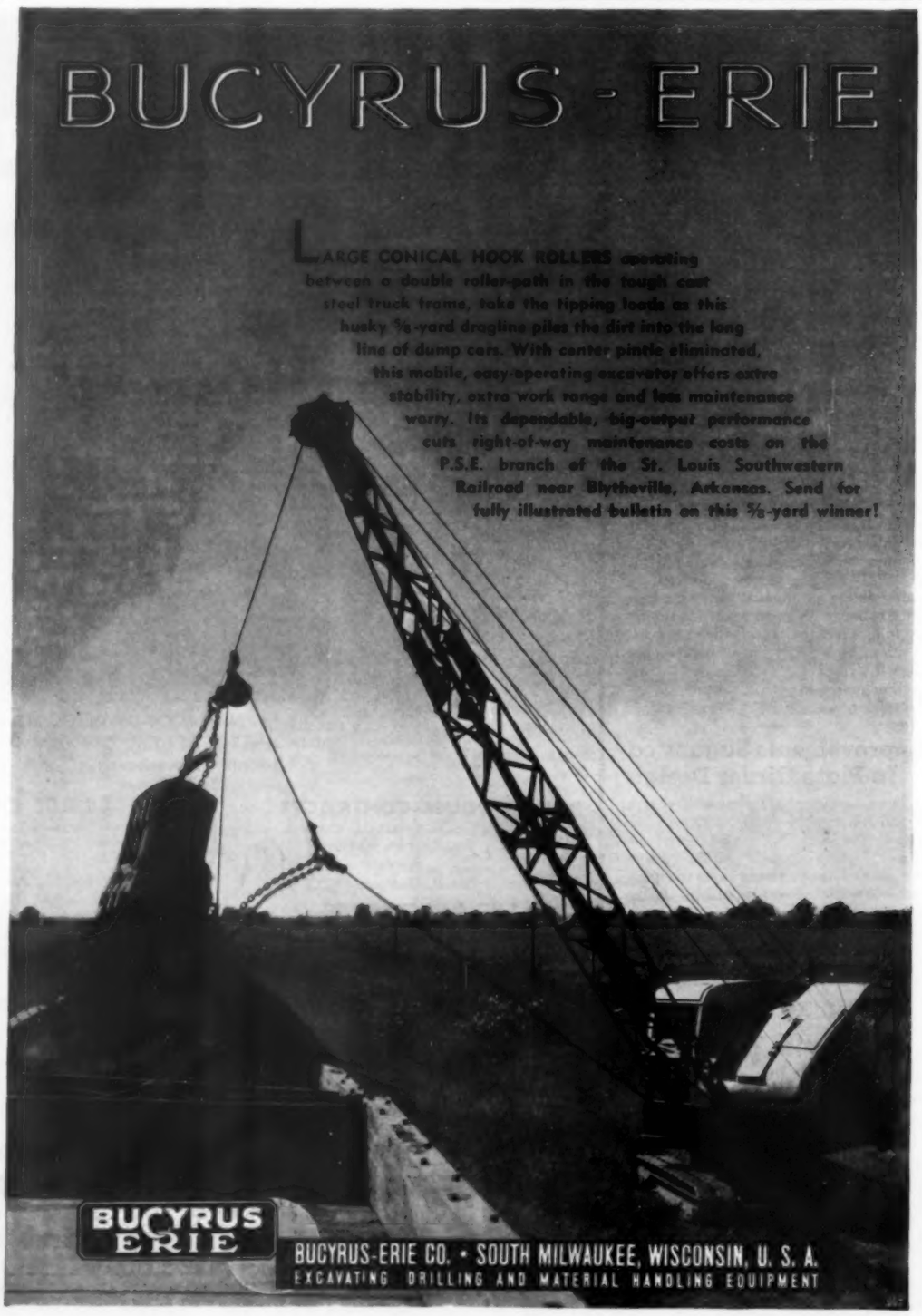
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LARGE CONICAL HOOK ROLLERS operating between a double roller-path in the tough cast steel truck frame, take the tipping loads as this husky ⅝-yard dragline piles the dirt into the long line of dump cars. With center pintle eliminated, this mobile, easy-operating excavator offers extra stability, extra work range and less maintenance worry. Its dependable, big-output performance cuts right-of-way maintenance costs on the P.S.E. branch of the St. Louis Southwestern Railroad near Blytheville, Arkansas. Send for fully illustrated bulletin on this ⅝-yard winner!
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EXCAVATING DRILLING AND MATERIAL HANDLING EQUIPMENT

Powered Lift on Ripper Clears Teeth of Debris

A road ripper with five working standards, any one or all of which may be raised without removing them from the frame, has been developed by the Rome Plow Co., Cedartown, Ga. The standards lift up and fasten with a simple latch when not needed and can be as quickly lowered together or individually by means of the power lift which is controlled from the tractor seat.

The Rome No. 50 ripper is designed for scarifying ahead of road graders, scrapers and elevating graders, for ripping up old pavements, shale, rock and stumps in the construction field as well as for clearing land. The standards are of the hay-rake type mounted in a 1-piece, high-carbon cast-steel frame of great strength. The 30-inch wheels have a 6-inch face and are made of cast steel. The five standards are of special-analysis manganese-carbon steel, heat-treated, with the front edge beveled to cut roots, shatter rocks and to lighten the draft. They are staggered 15 inches apart in "V" formation. The clearance between the outside standard and the wheels is ample to prevent boulders and stumps from lifting the ripper and interfering with its operation. The standard points are of manganese steel and of the slip-on type, being made reversible and interchangeable.

A feature of this ripper is that it can not be mired to the point where it is impossible to pull it out when the standards have been released. All standards in use can be released or re-engaged from the tractor seat and pivot individually into and out of a ripping position. Hooks are provided to secure the standards not required for a particular job, so as to hold them clear of the ground. The latching arrangement is such that when any standard or standards are hooked up in an inactive position they are clear of their latches and cannot interfere with the release or engaging of the other standards. The maximum penetration of the standards is 18 inches and they are adjustable to work from the surface down to 18 inches by means of an adjustable hand screw.

The Rome No. 50 Road Ripper

Engines Conditioned By a New Method

A new development in the conditioning of motor-truck engines has been announced by the Craver & Jay Co., 21 W. 10th Street, Kansas City, Mo. As assurance that no injury will come to any motor through conditioning by this method, the manufacturer offers a Lloyds-of-London insurance policy, providing payment up to $5,000 for any injury to a motor resulting from the use of the new conditioning product.

The conditioning method comprises the use of two products which come in handy containers packed in a single carton. The combusion chamber conditioner is applied through the carburetor and is made to purge the area in the top of cylinders of all foreign matter. The treatment frees the valves so they seat properly, loosens gum-stuck rings so they may expand against the cylinder wall, sealing compression and retarding the waste of gasoline and oil. The second product, the crankcase conditioner, is applied through the oil and performs the same service for the area not reached from the combustion chamber. Besides the cleansing properties of the products, each contains a specially prepared vegetable and petroleum lubricant that will not burn and which leaves a fine film to protect the valves and rings.

This new method, which takes only about fifteen minutes per motor, is of particular interest to fleet owners as it represents a considerable saving over the cost of new rings, carbon treating and valve grinding. Agents and distributors for this new method are being appointed throughout the country. Those interested in becoming agents or in using this method may secure further details direct from the Craver & Jay Co., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Handling Loads Safely

Many contractors are called upon to handle various kinds of loads with their cranes. Macwhyte Co., Kenosha, Wis., has issued a well-illustrated booklet "How to Handle Loads Safely" which depicts the use of Atlas braided wire rope slings in handling a wide variety of loads.

Copies of this booklet may be secured by any readers of CONTRACTORS AND ENGINEERS MONTHLY interested by writing direct to the manufacturer and mentioning this magazine.

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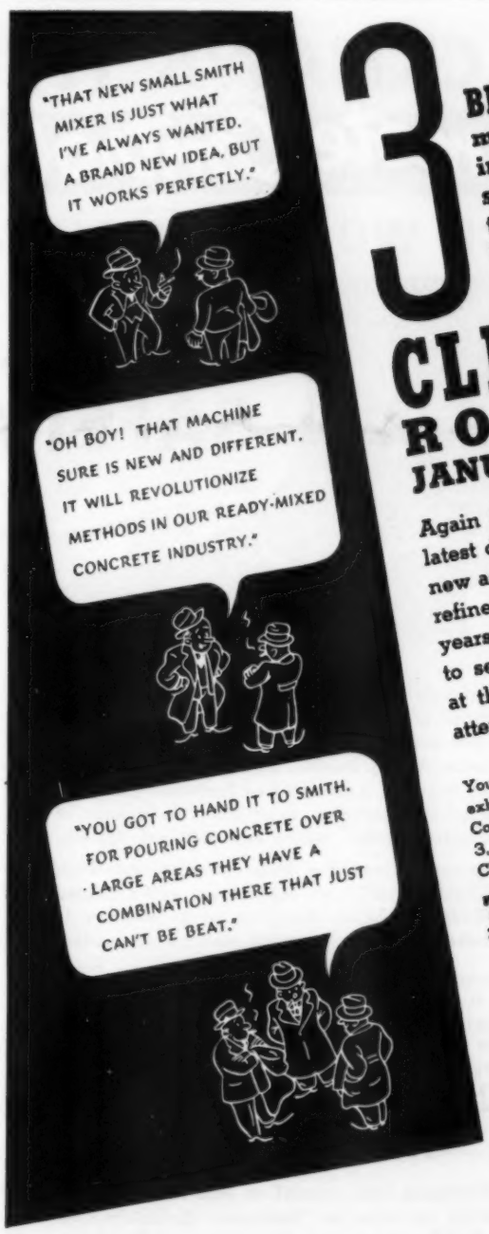
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You are also cordially invited to visit the T. L. Smith exhibit at the National Sand & Gravel and Ready-Mixed Concrete Exposition, Cincinnati (January 31 to February 3, inclusive) and at the Concrete Industries Exposition, Chicago (February 8 to February 11, inclusive).

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SMITH MIXERS

THE BOULDER DAM MIXERS

PICKS and SHOVELS

By O. E. POTTER

Inter-American Highway Still A Dream, Says Alaska Engineer

Not long ago we published an item in this column stating that the dream of an Inter-American Highway reaching from Alaska to the Argentine was about to become a reality. This optimistic comment brought us a letter from Hawley Sterling, Assistant Chief Engineer of the Alaska Road Commission, which subdues us considerably by stating:

"It is hard to refrain from taking exception to your front page statement under 'Picks and Shovels' in your July issue which reads, 'Within the next year or so, the International Highway from Alaska to Panama will be passable by car and the dream of those visionaries who first conceived of this highway link joining the Americas will have come true'.

"Progressive Alaskans wish the statement were true. The present status of the northern end of the International Highway, to the best of my knowledge, is as follows:

1. A sketchy reconnaissance survey has been made.
2. The project has been brought to the attention of the President who has verbally approved.
3. No funds are available.
4. Between Seattle and Fairbanks there is a stretch of about 1,000 miles in British Columbia and Yukon Territory and 180 miles in Alaska along the proposed route which has no road whatever.

"If the estimated $14,000,000 cost of this road is ever appropriated it could quite easily be built in the 5 or 6 years you speak of.

"We hope you will continue to boost for it."

Perhaps the enthusiasm of those promoting the Inter-American Highway and our own anxiety to see the completion of the project became the "father to the thought," so to speak, and we intimated that the project would become a reality sooner than it actually will. On the other hand, 5 or 6 years is hardly a long time in the future when considering the magnitude of the project to be completed. We have no illusions about the amount of work to be done but we were led to believe that progress was being made.

We are appreciative of Mr. Sterling's first-hand contribution to our knowledge of the subject and join with him in hoping that the dream of an Inter-American Highway may soon come true.

Concrete Baths

The beauticians have given mud packs considerable publicity as an aid to beauty but an old construction custom, recently brought to our attention by A. P. Robinson of Ransome, seems to go the mud packs one better by introducing concrete baths.

There is a common practice on concrete road jobs in some sections of New York State, and perhaps elsewhere, as a part of the final ceremony of finishing, to put everybody in the soft concrete and roll them around in it. The photo on page 56 illustrates the rough handling involved in the process on a paving job on U. S. Route 20 near Cherry Valley, N.Y., for which the Parlor City Construction Co., of Binghamton, N.Y., was the contractor and there's considerable question as to whether such concrete baths contribute to the beauty of the participants. However, it's all in the spirit of good clean fun and, apparently, a jolly good time was had by all concerned.

J. Shuman Hower, distributor of construction equipment in Utica, who sold the paver used on the job, was threatened with the same treatment but managed to escape by furnishing a half barrel of beer to top off the festivities.

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Placing low slump concrete with a MALL Universal Electric Concrete Vibrator

The Same Power Unit Can be Used For Both Operations!

By using MALL concrete vibrating and surfacing machines, concrete of superior grade and appearance can be secured over hand puddled and hand rubbed concrete.

You will make greater profits on your next job by using these efficient labor-saving, quality-improving tools.

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BLACKHAWK HYDRAULIC Remote Control Jacks

PLACE WORKMEN in the ZONE of SAFETY

THE Blackhawk Remotely Controlled Hydraulic Jack solves many serious problems for contractors and engineers because the ram and pump are not combined in one unit as in ordinary jacks. A long, flexible, high pressure hose separates the ram from the hand-operated hydraulic pump — thereby placing the workman away from the danger of crumbling concrete, flying blocks and shivered timbers.

Blackhawk Remotely Controlled Jacks have the same high operating efficiency (94%) as the famous self-contained Blackhawk Hydraulic Jacks. However — in addition to the safety factor — these important features are added:

LIGHT WEIGHT — Ram is easily handled and positioned because pump unit is separate. 20-ton ram weighs less than 12-ton jack.

ALL-DIRECTIONAL POWER — Full hydraulic action with ram in any position — up, down, sideways or at angle.

GREAT OPERATING EFFICIENCY — Operator stands at distance to sight job. Ram cannot be jiggled out of place by operation of pump handle.

PERFECT CONTROL — Release valve on pump gives operator control of raising and lowering of load to 1/1000 of an inch.

Blackhawk Engineers offer counsel on your jack problems. WRITE TODAY for data on "Blackhawk Remotely Controlled and Self-Contained Jacks."

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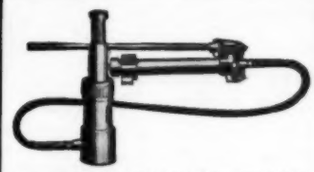

S-67 Heavy-duty 20-ton ram: 10¼" over all; screw extension, 3¾"; total height, 18".

S-66 7-ton ram for close quarters. Only 4⅛" over all; plunger travel, 2½".

S-71 10-ton capacity; threaded to handle attachments for pushing, pulling, clamping, spreading and twisting.

PATENT APPLIED FOR

BLACKHAWK HYDRAULIC JACKS

Portable Power Plants Aid Field Maintenance

Road contractors and their construction superintendents are particularly interested in equipment which will economically aid in the maintenance of heavy-duty machinery in the field. The small power and light plant shown in the illustration, manufactured by the Kato Engineering Co., Mankato, Minnesota, is a Model JRA-3, weighing only 55 pounds, which is fully portable and furnishes 350 watts of standard 110-volt, 60-cycle alternating current. It will operate such standard appliances as electric drills, saws, grinding wheels, floodlights, radios, and other small equipment.

The plant consists of a self-excited generator connected directly to a small gasoline engine. It also provides about 10 amperes direct current at six volts for charging car and radio batteries or for other purposes. This company also manufactures a complete line of ac and dc plants, ranging in size from 300 to 10,000 watts, which are described in literature which will be supplied free on request to readers mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Heavy-Duty Tractor For Snow Removal Work

The Case LI heavy-duty special tractor with cab, electric starter and lights which the J. I. Case Co., Racine, Wis., will exhibit at the Road Show in Cleveland, is specially designed for heavy-duty snow plowing on township, county and state highways. Equipped with a Model 555 Good Roads V-type snow plow with two wings and power hydraulic controls, this unit will stand up under the most severe operating conditions, according to the manufacturer.

The tractor is compact, with a 79-inch wheelbase, and its concentrated weight does double duty, carrying the side thrust of the plow and adding to traction. The sturdy flat-torque engine has four gear speeds, and a governor gives a working range of from 1½ up to 15 miles an hour. The oversize dual tires are of a special low-pressure type designed expressly for work in soft footing. Over 400 square inches of ground contact give broad support in soft spots.

Complete information on this Case-Good Roads snow-plowing unit is contained in literature which interested state, county and township highway engineers may secure direct from the manufacturer by mentioning this magazine.

Complete Power Unit, New Product of LeRoi

Among the exhibits of new equipment at the A.R.B.A. Road Show in Cleveland will be a new 4-cylinder 3¼x4-inch L-head power unit recently brought out by the LeRoi Co., Milwaukee, Wis. This Model D-133 is rated at 25 hp at 1,800 rpm and is made with both direct drive and several different gear reductions, all available with or without clutch.

This power unit, which is unusually compact and sturdy, has been designed especially for heavy-duty service and is equipped as a complete unit, with all

A Portable Power Unit Operating an Electric Drill for a Repair Job in the Field

accessories necessary for operation, including full-pressure feed lubrication, water pump, high-tension magneto with impulse coupling, carburetor, gasoline tank, fan and radiator, all enclosed in sheet steel housing.

Complete information on this and other sized LeRoi power units, as well as its new line of portable air compressors which will be exhibited at the Road Show, may be secured direct from the company by mentioning this magazine.

New Buckets on Exhibit At Cleveland Road Show

Three new products, a combination orange peel bucket and grapple, a new light material-handling bucket and a new extra-heavy round nose bucket, will be exhibited by the Owen Bucket Co., 6030 Breakwater Ave., Cleveland, Ohio, in its booth at the Road Show in Cleveland.

The new combination orange peel and grapple is the development of an original mechanical principle, thoroughly proved in practice, which produces greater gripping power and increased digging ability. The jaws operate independently and, if meeting resistance, dig deeply into the material and then anchor, and also grip a rock regardless of the irregularity of its shape.

The new light Type S bucket is designed for maximum capacity with minimum weight by using alloy steels and a light welded steel counterweight. The extra-heavy round nose Type DX is designed for exceptional strength and digging ability. The centers of the lips on the round-nose bucket penetrate the material with comparatively minimum resistance and these curved lips carve their way deeply into the material, assuring greater loads at the full width of the bite.

Complete information on these and other models of Owen buckets and grapples may be secured by those interested direct from the manufacturer.

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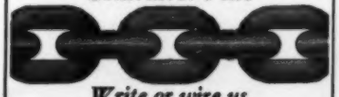

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First public showing at the Road Show—MODEL 25—a modern, fast ½-yard shovel with a working weight of 25,000 pounds—and of course it has:

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and all the other features of standard BAY CITY design based on quality and performance—not on *"how cheap can it be built."*

Look over the 25 Reasons and you will know why it will pay you to compare *Bay City* construction materials, design accessibility, speed, working ranges and safe load capacity with any machine in the same weight and capacity before buying your next shovel. The BAY CITY will give you yardage at low cost—they are definitely proven to be most desirable, economical and efficient in operating service.

You cannot equal BAY CITY value or performance—regardless of price.

Write for latest catalog and details.

BAY CITY SHOVELS, INC.

BAY CITY, MICH.

240 Miles of Roads In Indiana Improved

More than 240 miles of paving and grading on the Indiana state highway system was completed during the first seven months of 1937, according to a recent statement by Earl Crawford, Chairman of the Indiana State Highway Commission. This total does not include the resurfacing, surface treatment, and oiling programs which will result in the improvement of an additional thousand miles of state highways.

Reports of work completed up to August 1 show 113.54 miles of high-type surface, 112.62 miles of low-cost surfacing, and 14.13 miles of grading. Approximately 69 miles of this work was completed during July of this year, including 52.68 miles of high-type surfacing, 15.22 miles of low-cost surfacing and 1 mile of grading.

It was expected that the mileage completed during August would increase materially the improved mileage in the State of Indiana.

New Sales Manager of F-M Diesel Division

Fairbanks, Morse & Co., Chicago, Ill., has announced the appointment of T. M. Robie as Manager of the Diesel Sales Division. Mr. Robie has been associated with Fairbanks-Morse since he returned from World War overseas service in 1919 and has served in numerous capacities in the manufacturing and sales division. Since 1932 he has been in charge of diesel sales to resale manufacturers.

Previously he was associated with the New York branch office for one year and the Dallas office for two years, and was employed at the factory on diesel engine designing, testing and building for nine years.

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WHAT good is horse power, if you can't use it? And how can you use it unless you have *traction?* While it is true that all motor vehicles have traction, some have more than others. Some will stall if they slip one wheel, others if they slip one rear and one front wheel at the same time.

Only WALTER SNOW FIGHTERS and TRACTOR-TRUCKS will keep going as long as one wheel has traction. A Walter cannot be stalled unless all four wheels lose traction at once—a most unlikely happening. This is due to the Walter patented *four-point positive drive.* Three automatic locking or power proportioning differentials provide correct differential action between all wheels, front and rear, right and left. They divide the power so that the wheels with least traction get the least and those with most traction the most power. This super-traction insures a positive drive on all four wheels on slippery ice and snow, muddy roads and rough trails.

For heavy snow removal, road construction and maintenance, logging, coal stripping — tough jobs anywhere — you need WALTER 100% TRACTION.

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WALTER MOTOR TRUCK CO.

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Highway Lighting Costs Discussed

Extensive Installation In Schenectady County Furnishes Basis for Future Safety Lighting

By WILLIAM W. CHADSEY,
County Superintendent of Highways, Schenectady County, New York

✦ SINCE the turn of the century, the development of the automobile has brought with it an ever-increasing number of problems. Particularly in the past decade have many of these problems become acute.

As the automotive engineer moves on toward his goal of ultimate perfection, we find the highway engineer striving to keep pace, and the dirt roads of a bygone day yielding the thousands upon thousands of miles of two, four and six-lane highways, whose smooth, hard surfaces carry more and more pleasure vehicles, trucks and busses with each passing day. It is this constantly growing stream of traffic which leads the engineers to realize that they have, in a sense, created a Frankenstein, a monster which takes an appalling annual toll in lives and property damage.

Therefore, it has behooved the engineers to make safety keep pace with other forms of progress. One of the greatest and most important developments on the part of the highway engineer has been made in the field of highway lighting—an absolute necessity if we are to reduce the staggering number of night-time accidents on our highways.

Early Safety Lighting

Before 1930, the sporadic installations of highway lighting, in rural and suburban areas, were made by the residents of those districts, who united to have their power companies install a few low-power lights at scattered intervals along the highway in front of their homes. These installations were far from efficient, but they were a step in the right direction. Then, in 1930, lighting engineers introduced highway lighting units of 400 candlepower, advising their installation at intervals of not more than 250 feet.

This, of course, was a vitally important forward step toward making our highways safe after dark, both for the driver and the pedestrian. The engineers, however, kept up their research, and 1935 brought the development of the 1,000-candlepower sodium vapor unit, which produces a more uniform illumination, with a great reduction of glare, both from the units themselves and from the lights of vehicles. This year also brought the high-visibility incandescent lighting unit for highways in residential districts, which throws light on the highway while shielding it from the houses located along the side of the road.

Recent Installations

Previous to 1936, highway illumination in this county was confined to 27.66 miles of heavily travelled roads, lighted with 400-candlepower incandescent units. The year of 1936 saw an installation of 18.24 miles of 1,000-candlepower sodium vapor lights, at that time the world's most extensive installation of this type of highway lighting. Also, 5.33 miles of 400-candlepower high-visibility incandescent lighting units were erected on another state highway.

These two types of highway illumination are generally considered by engineers and drivers of motor vehicles alike as practically perfect lights for highway purposes, since they give a maximum of vision even in fog and storm, and, at the same time, reduce the glare from oncoming headlights to a minimum.

Costs

Granted that highway lighting is an important factor in the reduction of nocturnal accidents, and it has been all of that here in Schenectady County in New York State, a question still remains. It is a question of costs, cost of installation, cost of maintenance, cost of operation, and other costs which are bound to occur. We who are in constant touch with the problems of highway safety are often convinced that no price is too high to pay for the protection of highway lighting but it remains to convince the taxpayers that the actual cost is not exorbitant. It is with this purpose in mind that I am setting down costs covering installation and maintenance of the different types of lighting to be found on Schenectady County's 51.23 miles of illuminated highways.

The initial cost of installing a system of highway luminaires will depend upon many factors, namely the units used, the type of pole and power line construction, and the physical size of the area to be illuminated.

Schenectady County has two modern types of safety lighting in operation on its highways. One system, employing sodium luminaires, wood poles and overhead power line construction, costs the county $1,658 a mile a year to operate over a five-year period. Another system, employing high-visibility incandescent units, with similar pole and power line construction, costs $1,842 a mile per year. Cost of all equipment, construction, maintenance, and amortization are figured in the annual cost per mile. After a five-year period the cost per mile, if consistent with that obtained under our first contract, will be decreased about 27 per cent, because the equipment will be amortized at the end of that time. These were the first systems to be constructed in this vicinity and we are of

(*Continued on page 47*)

High-Visibility Incandescent Lighting Shows Up a Hazardous Curve Along the Balltown Highway, Schenectady

5 LITTLEFORD STARS
See Them At Booth C-7
★★★★★ROAD SHOW
CLEVELAND, OHIO....JAN. 17-21

1. WHEELED ROLLER
See the New Littleford Motorized Wheeled Roller, equipped with brakes, water tank, an easier lifting arrangement and 7 H.P. Wisconsin Motor. These new improvements make the Wheeled Roller more useful for all types of road maintenance work. See how you quickly convert this handy patch roller into a high-speed trailer unit.

2. No. 101 UTILITY SPRAYER
See the newest improvements on the No. 101 Utility Sprayer. Ask for figures on your savings in time, labor and material costs with this modern maintenance outfit.

3. DRAG
A new idea for bituminous road mix resurfacing work. Non-segregating. Complete mix in one pass. Floating mixers reach every particle of aggregate. Smooths out existent high and low spots. Complete coverage of every particle. This drag has been tested on actual highway work for several years. It builds better roads at lower costs.

5. MODEL "C" DISTRIBUTOR
A new type of spray bar, new relief valving system, protecting apron over spray bars, streamlined guards over rear wheels and several other improvements have all been added to the Littleford Model "C" Pressure Distributor since you last saw it. Don't miss seeing this distributor.

4. No. 84-HD KETTLE
This is the original and only kettle with the two patented time and money saving advantages. "Double Heat Circulation" and the A shaped Screen Reservoir. See for yourself how these features save the cost of the kettle quickly.

Other Features to See
There will be a generous assortment of Littleford oil burners, concrete heaters, traffic line markers, and other smaller equipment on display in the Littleford Booth C-7. Don't miss it. See the pictorial displays of Littleford equipment in action. New literature and data on equipment and methods free for your request.

BLACK TOP ROAD MAINTENANCE EQUIPMENT
LB
SINCE - 1900
LITTLEFORD
LITTLEFORD BROS.
485 EAST PEARL STREET
CINCINNATI, OHIO

Two Roza Tunnels Near Completion

(*Continued from page 2*)

installed. With a pressure of 110 pounds at the compressor receiver tank, the pressure was maintained at 95 pounds at the heading over a mile and a half away.

At the portal of No. 3, there was a similar plant consisting of two Sullivan compressors of an aggregate capacity of 2,380 cfm and one Gardner-Denver of 450 cfm. Six-inch pipe was used there and the same pressures maintained. A 2-inch water pipe, run through the length of the bore, carried 70 pounds pressure, maintained by a 20,000-gallon tank on the hillside 200 feet above the portal of the tunnel.

During work in solid rock, 48 holes were drilled, 11 to 13 feet, loaded with about 450 pounds of explosive to the round and a 10 delay. Where work was in softer materials, as near the tunnel ends, about 30 7-foot holes were drilled, using only about 75 pounds of du Pont 45 per cent gelatin and a 5 delay. In good rock, the drilling was completed in an hour and a half, and on an average about 200 cubic yards of muck was produced at each round.

Combined Jumbo and Cherry Picker

Featured in the operations at the face was a cherry picker designed and built as a unit with the jumbo, both being constructed so that not only the cars but also the Conway mucker could pass beneath it. This cherry picker, operated by a 20-hp gear-reduction motor for hoisting purposes, could pick up an empty car and swing it above the track with sufficient clearance so that other cars could pass beneath. An empty car could, therefore, be spotted directly behind the Conway and while it was being loaded another empty could be hoisted by the picker, let down behind the car and pushed up to the mucker when the preceding loaded car had been pulled out. In that way, the whole train could be loaded expeditiously in a leap-frog fashion. Mucking was carried on with rapidity, in one case a train of seven cars, carrying 35 cubic yards, having been loaded in 20 minutes. The jumbo-cherry picker unit operated on a 10-foot gage track. Drilling was done ordinarily with three of the Worthingtons operated from the upper deck and four on the bottom. The whole rig, including jumbo, cherry picker, carriage and equipment, weighed over 10 tons.

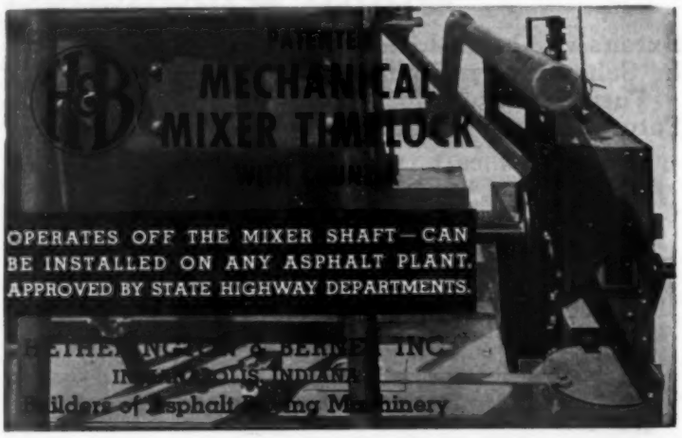
Side-track arrangements were provided some distance from the face so that a train of empties could be brought in from the outside and left there while the other train was being loaded. Shunting operations at the face, moving the jumbo away from the face during loading and shooting and the subsequent mucking out were performed by a Baldwin-Westinghouse 8-ton combined battery and trolley locomotive running on industrial tracks.

Outside in the shops the drill sharpeners were busy. An Ingersoll-Rand 54 sharpener was located at each portal. In hard rock, at No. 3, approximately 1,500 steels were sharpened in 24 hours, and more than 1,000 feet of steel was consumed a month. At No. 1, about 800 drill steels were sharpened every 24 hours.

Personnel

Tunnels Nos. 1 and 3 are but two links in the extensive system of waterways that will be required to irrigate the 100-mile strip of land adjoining the Yakima River and known as the Roza Project. In addition, there will be another long tunnel as well as 100 miles of lined and unlined main canal and about 200 miles of laterals. A total of over 70,000 acres of land will be irrigated by the system, the last unit of the irrigation plan adopted by the Bureau of Reclamation over 15 years ago. Most of this land is the equivalent in productive possibilities of the rest of the Yakima Project which for years past has been one of the great fruit-producing districts of the country.

On these two contracts, C. R. Shinn is General Superintendent and S. A. Dahlberg, Project Superintendent for Morrison-Knudsen Co. and for the Bureau of Reclamation, C. E. Crownover, Construction Engineer, is in direct charge of the work.



SIMPLE RUGGED DEPENDABLE
STERLING QUALITY
CONSTRUCTION EQUIPMENT

Self-cleaning pump cases and open trash type impellers make these pumps ideal for pumping dirty, gritty water. This is why Sterling Pumps are selected by largest Contractors everywhere.

Write Today for Literature and Prices

Sterling MACHINERY CORPORATION

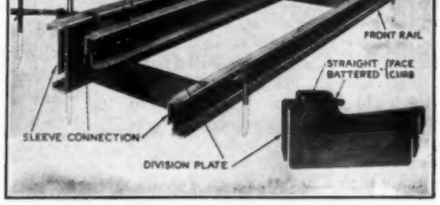
Co-operation . . .

● More than 30 years ago Heltzel Engineers recognized the need of a superior steel form for concrete sidewalk, curb, and curb-and-gutter construction. One set of interchangeable forms that could be used over and over and still retain the fast setting–fast stripping qualities so necessary for fast, trouble-free operation.

● After many years of close co-operation with contractors and construction engineers Heltzel Steel Forms have been developed to the highest degree of efficiency –one set of forms to construct either curb or curb-and-gutter projects.

● Your copy of Bulletin S-20F, describing in detail these all-purpose, heavy duty forms, is ready. Write today, or get one from our display–Section C-35–C-36 at the Road Show.

Curb-and-gutter forms with curb gradually sloping into gutter.



Forms for building battered curb. Note collapsible division plates.

Complete 10 ft. section Heltzel Utility forms for combined curb-and-gutter construction.

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO, U.S.A.

Road Maintenance In Snowless Winter

(*Continued from page 1*)

of work is more expensive than snow removal.

The snow removal program consists of winter maintenance on a total of 1,965 miles of road, of which 1,762 miles are state highways and 203 miles are town roads maintained on a cooperative basis.

Plowing and sanding operations are the most important and expensive work in the snow removal program but the minor operations, such as the work of erecting snow fences for the prevention of drifting and the clearing of waterways and drainage ditches, are nevertheless essential for the proper fulfillment of this program.

In order properly to execute the work of keeping the highways open and safe for winter travel, it is essential that proper equipment be provided and maintained. The preparation for this work must be accomplished during the summer in order that everything may be in readiness when the first storms come in the late fall. It is therefore necessary to expend a considerable amount of the money allotted for snow removal work in the summer months, painting, overhauling and repairing our snow-removal equipment.

Organization for Work

A successful snow-removal program must be well planned and organized in order to operate effectively and economically, and for this reason every available resource is utilized. Arrangements are made with the state and local police to notify the men in charge of this work in their respective localities whenever dangerous or unsatisfactory conditions develop, especially at night.

The Main Office at 100 Nashua Street, Boston, receives frequent reports from the districts during the progress of the work, and the public may receive information regarding the condition of all state highways at any time at this office or the district offices. The State is divided into seven districts and each district is divided into several maintenance sections of approximately 30 miles in length with a foreman in charge of each section, working under orders from the district maintenance engineer, and he has on call at all times a crew of men who are available for this work. The State Department of Public Works receives daily weather forecasts and in case severe storms are predicted, this information is sent to the district maintenance engineer who, in turn, notifies the section foreman. This information is also given to the shop superintendent at the State garage in order that emergencies may be met as the storm develops.

Equipment

The snow-removal equipment consists of 141 four-wheel-drive trucks equipped with various types of plows, five 10-ton tractors and eighteen 5 to 6-ton tractors. The tractors are used only as emergency units. There are also 120 1½-ton maintenance trucks which are auxiliary snow-plow units used mostly for light plowing and plowing on ramps at grade separations. The 2½-ton trucks are equipped with modern one-way plows which are valuable for patrol and widening work. The 6 to 8-ton trucks are equipped with one-way plows for patrol and widening work and are also equipped with interchangeable V plows which can be changed in approximately 20 minutes. This type of plow is used as an emergency unit where snow is drifting badly and there is a possibility of the road becoming blocked.

The newer trucks are equipped with special electrical systems, air brakes, oil steering and the latest oil hydraulic system for the operation of plows and bodies. Each truck is equipped with hydraulically operated plow wings which are necessary for cutting banks and widening. These trucks are also equipped with weatherproof heated cabs and necessary conveniences for the operators, such as sleet removers, etc. These items for the convenience of the operator form a very minor part of the cost of the unit but during a storm they play a very important part, as the operator of the truck is the guiding hand and anything that increases his facilities increases the efficiency of the truck many times. In addition to the equipment listed above, hired trucks are used to supplement the state-owned equipment during the storms.

For the protection of the public, as well as the state employees, it is absolutely necessary that an adequate lighting plant be furnished on the trucks in order that the front and rear of the trucks may be well lighted. The standard equipment at the present time consists of a set of three cluster lights, two tail lights, a body light, a large red warning or sanding light, and in many cases lights are provided directly above the sand spreader. This lighting has necessitated a change on snow-removal trucks from a 6-8 volt system to a 12-16 volt system with a generator which is capable of supplying nearly enough power to light the average home.

Sanding Roads

The work of sanding our highways has greatly increased during the last few years and is conducted under the same organization as the plowing of snow. Practically all state-owned snow-removal units are equipped with mechanical spreaders which are used on sanding work. This equipment is also supplemented with hired trucks, most of which

(*Continued on page 53*)

At the CLEVELAND ROAD SHOW Booth D11 SEE the NEW Owen Orange Peel

An original mechanical principle, thoroughly proven in practice, gives this new combination orange peel bucket and grapple greater digging ability and also greater gripping power.

See it at the Road Show. Also see a model in operation showing the independent action of its jaws. Visualize how the jaw meeting the least resistance digs deeply into the material and anchors—to be likewise followed by the other three jaws.

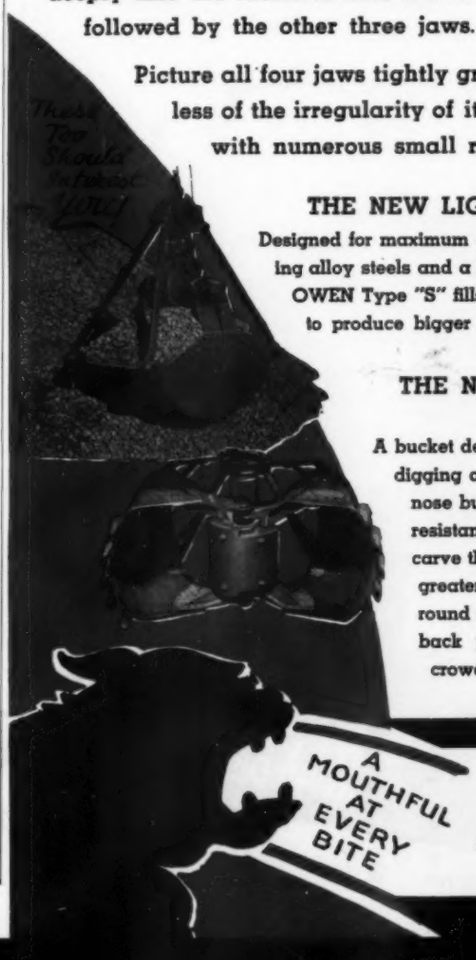
Picture all four jaws tightly gripping a large rock regardless of the irregularity of its shape, or filled to capacity with numerous small rocks.

THE NEW LIGHT TYPE "S" BUCKET

Designed for maximum capacity with minimum weight, by utilizing alloy steels and a light welded steel counterweight, the new OWEN Type "S" fills the need for a stronger light type bucket to produce bigger pay loads in the material-handling field.

THE NEW TYPE "DX" EXTRA-HEAVY ROUND NOSE BUCKET

A bucket designed for exceptional strength and greater digging ability. The centers of the lips on the round nose bucket penetrate the material with minimum resistance and these curved lips continue to carve their way deeply into the material, assuring greater loads at each grab. See this stronger round nose construction with no corners or square back plates to retard the entrance or cause crowding of material.



THE OWEN BUCKET CO.
6030 Breakwater Ave. CLEVELAND, OHIO
Branches: New York Philadelphia Chicago Berkeley, Cal.

Salt Stabilization In Stage Construction

Cayuga County, N.Y., Finds Use of Salt to Stabilize Base for Future Bituminous Roads Keeps Base Free of Dust and Pot Holes

By GAIL BALL, Superintendent, Cayuga County, N.Y., Department of Highways

✦ CAYUGA County builds most of its county road system by stage construction. First, the culverts and ditches are constructed, the heavy grading done and then either a gravel covered cobblestone base, an 8-inch crushed stone base, or a run-of-bank gravel base 12 to 15 inches deep is laid. This is the first step toward a future bituminous road and remains in this stage for 2 years before the final step of covering with a bituminous macadam surface of either a mixed-in-place or penetration type.

We have found that by adding a stabilizing agent while laying the base, we have a base surface smooth and free from dust and pot holes during the intervening time before completion of the final surfacing.

During 1937 we built three grading and foundation course projects on which grade CC mined rock salt was used as the stabilizing chemical. This program was carried out after observing an experimental project, 1¼ miles long and built of a coarse grade of run-of-bank gravel, completed in September, 1936. This road held up compact and dustless during the past summer, in spite of the fact that it carried additional detour traffic for the greater part of the season. This additional traffic provided a severe test by which to judge the merit of the salt-stabilized surface and we were more than satisfied with the result.

Three 1937 Projects

Three types of material were used this year in our base stabilization program. One project was built of run-of-bank gravel placed in two courses, the first of as coarse gravel as was available and 10 inches deep, and a second course of 4 to 5 inches of finer gravel as a finish course. The top course was worked to grade and after compaction by rolling was scarified with a York rake to a depth of 1½ to 2 inches, following which the salt was worked into the surface, using 12 tons of salt per mile of 14-foot road. The surface was again worked over several times with the York machine, using both the rake and scarifier attachments. This operation thoroughly mixed the salt with the gravel and trued up the surface of the roadway, which was then rolled. In spots where there was not enough ground moisture to provide good compaction, the surface was sprinkled and then rolled again.

The second project had a crushed stone base, built of 1 to 3-inch crushed limestone. The large stone was choked with limestone dust and dirt until the voids in the stone were completely filled. A smooth surface was obtained by a cover course of small-sized washed limestone. Shoulder binder was used to fill this smaller stone. The salt was then applied in the manner and quantity described above and very good results were obtained.

The 1937 Salt-Stabilized Gravel Base Project in Cayuga County, N.Y., After Compaction

The third project was also a stone base but the quality of the limestone was not as good as that used on Project 2 and we were unable to obtain sufficient limestone dust to fill the voids in the 1 to 3-inch base stone so we had to resort to the use of shoulder binder of loam dirt. After filling the voids in the stone, the surface was thoroughly compacted. The finished course of this project was built of crusher dust to which ½ to 1-inch stone was added and mixed. This material came from a poor grade of limestone containing considerable dirt. It was spread over the base to a depth of 2½ inches and leveled to grade. Salt was then applied in the same manner as on the other projects. This cover material seems to be an ideal mixture for salt stabilization. After the first rain, the roadway was rolled and a very tight fine-textured surface which is tough and durable was obtained.

It has been our experience that the stabilization of these stage construction projects is a very great help in preserving the surface during the years which we allow for settlement and in addition provides a more even, unbroken and dense surface upon which to place our bituminous macadam-wearing surface course.

WON'T QUIT
or cause time out

A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company
32-56 Dey Street
New York, N.Y.

Hayward Buckets

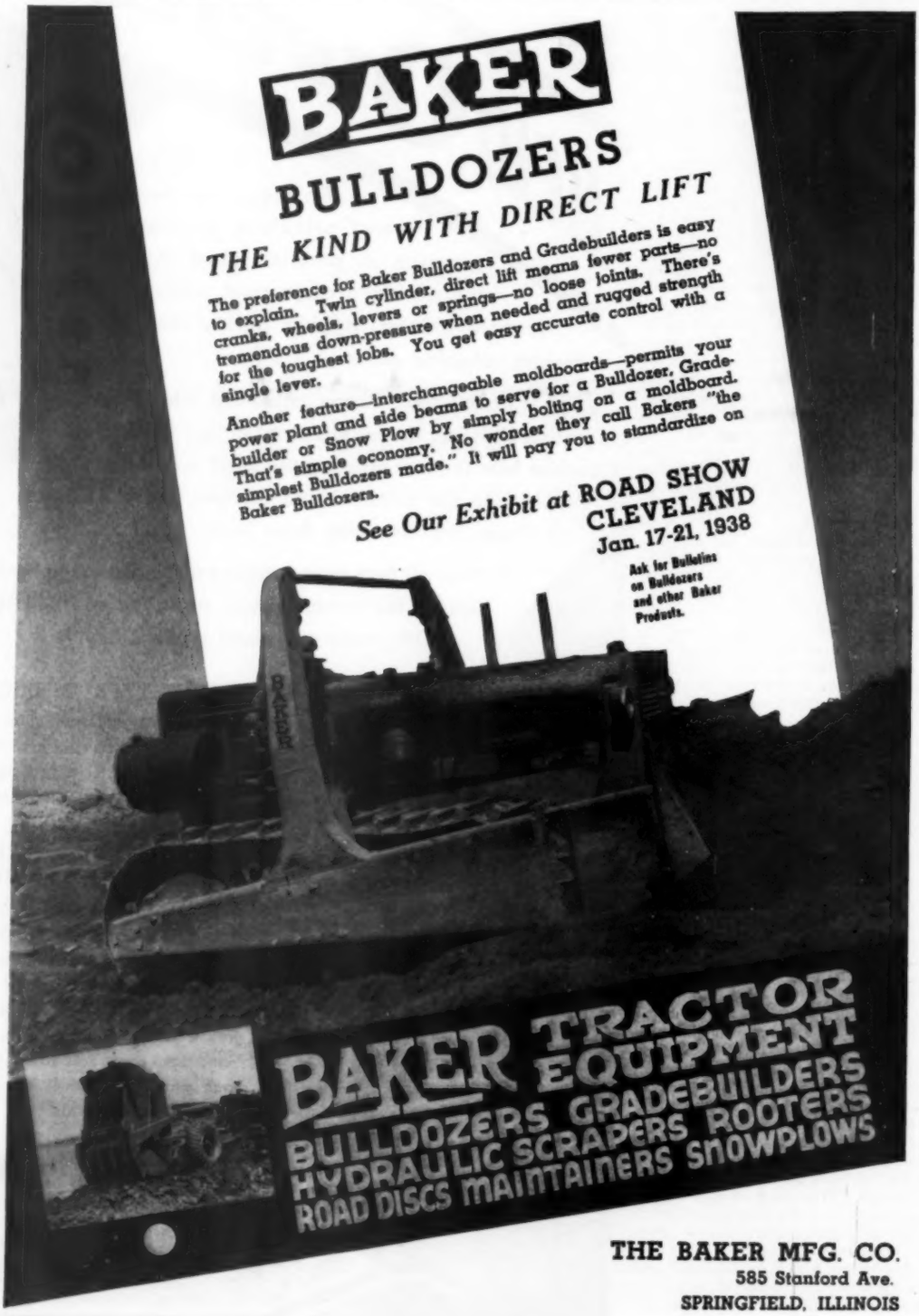
BAKER
BULLDOZERS
THE KIND WITH DIRECT LIFT

The preference for Baker Bulldozers and Gradebuilders is easy to explain. Twin cylinder, direct lift means fewer parts—no cranks, wheels, levers or springs—no loose joints. There's tremendous down-pressure when needed and rugged strength for the toughest jobs. You get easy accurate control with a single lever.

Another feature—interchangeable moldboards—permits your power plant and side beams to serve for a Bulldozer, Gradebuilder or Snow Plow by simply bolting on a moldboard. That's simple economy. No wonder they call Bakers "the simplest Bulldozers made." It will pay you to standardize on Baker Bulldozers.

See Our Exhibit at ROAD SHOW
CLEVELAND
Jan. 17-21, 1938

Ask for Bulletins on Bulldozers and other Baker Products.



BAKER TRACTOR EQUIPMENT
BULLDOZERS GRADEBUILDERS
HYDRAULIC SCRAPERS ROOTERS
ROAD DISCS MAINTAINERS SNOWPLOWS

THE BAKER MFG. CO.
585 Stanford Ave.
SPRINGFIELD, ILLINOIS

New Diesel Engine Announced by Buda

A new 4-cylinder diesel engine, designed for all types of small portable use, such as trucks, tractors, small shovels and construction equipment, has been announced by the Buda Co., Harvey, Ill.

The new Model 4-DT-196 Buda diesel has four cylinders with a 3⅝-inch bore and a 4¾-inch stroke, giving a total piston displacement of 196 cubic inches. The fuel consumption is from 0.45 to 0.5 pounds per bhp-hour. Ignition is by compression both for starting and running. The engine is equipped with a full-circulating pressure system for lubrication and a plunger-type fuel-supply pump, with hand primer, integral with the fuel injection pump. The cylinder heads are cast chrome-nickel iron with replacable exhaust-valve inserts and the pistons are of aluminum alloy. The average weight of this model with accessories is 885 pounds.

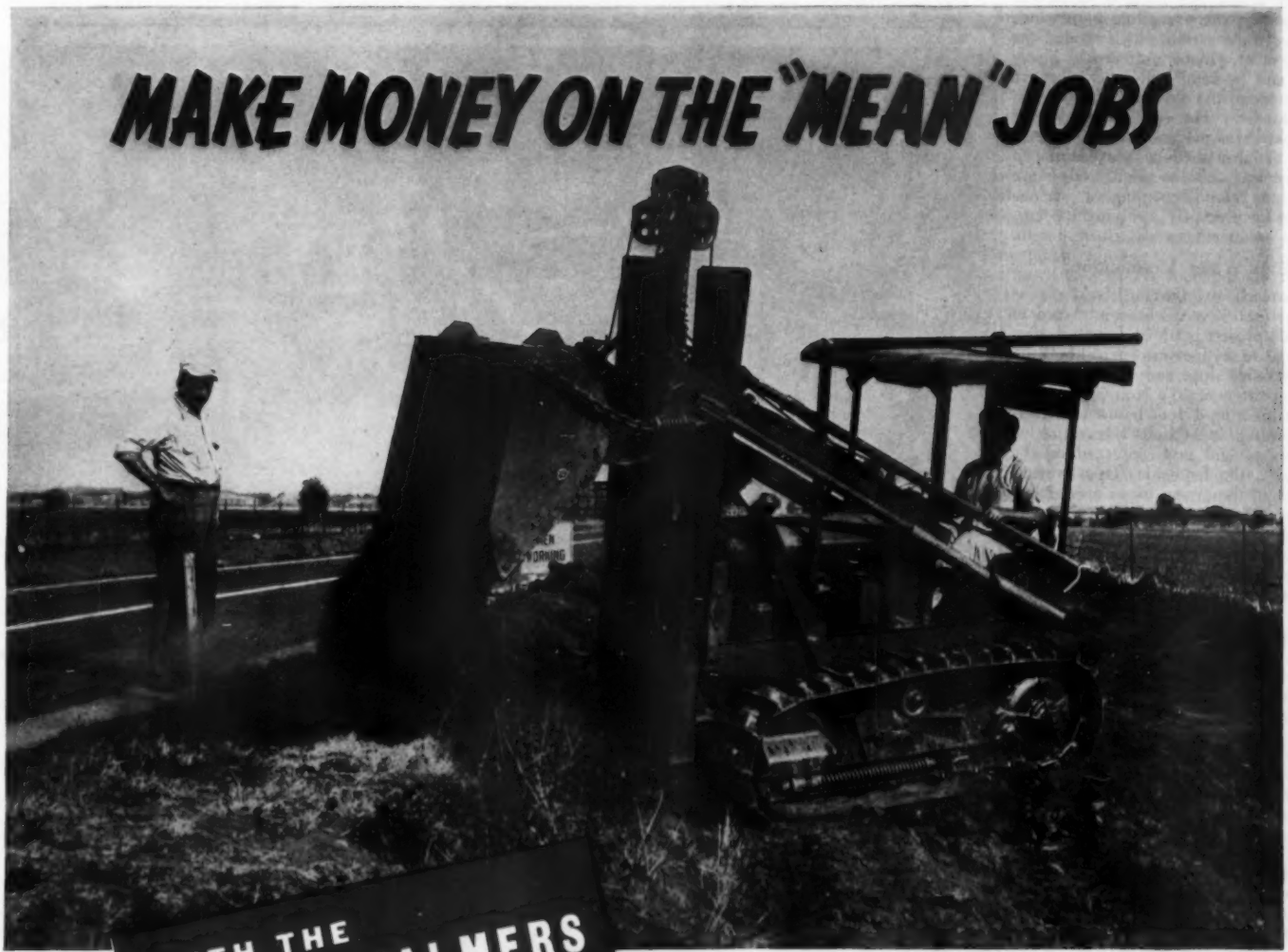
A New Motor Oil for Heavy-Duty Equipment

The 1938 Road Show marks the tenth year of participation by the D-A Lubricant Co., Inc., of Indianapolis, Ind., manufacturer of specialized lubricants and motor oil for heavy-duty equipment. In addition to D-A lubricants, the exhibit will feature the new D-A motor oil, which was introduced to the heavy-duty equipment field early this year. This new oil combines a safe and effective carbon inhibitor with the superior lubricating qualities of a Pennsylvania oil. While its properties are especially applicable in diesel engines, it is equally suited for use in gasoline engines, being non-acid and, consequently, non-injurious to alloy bearings.

The D-A Lubricant Co., Inc., has recently enlarged its production and storage facilities to produce this new oil, making it one of the most modern and completely equipped plants in the industry.

New Armco Manager In New York District

Murray B. Wilson, who has been associated with the American Rolling Mill Co., of Middletown, Ohio, since 1923, has been named Manager of the New York Sales District for Armco. Following his graduation from Miami University, Mr. Wilson started as a mill worker at the Armco plant in Middletown. He later was assigned to the Home Office Sales Division and since 1927 has been attached to the Detroit sales district office of the company. He succeeds Cliff Spear who was forced to curtail his activities because of continued ill health.



You can do small, "mean" jobs at a profit with the Allis-Chalmers Model WM and Hough Hydraulic Loader. Watch how quickly this outfit removes dirt from around culvert headwalls, bridge wings and abutments. See how it cuts labor costs preparing rip rap beds, digging special ditches, excavating for the removal of old pipe or for placing new pipe. Note how easily it wings back cuts . . . where other equipment finds the going tough. Just the thing for removing surplus dirt between forms for fine grading on concrete work. Does a channel change job in a hurry. Especially handy for finishing. These are but a few of the many miscellaneous, cost-cutting uses of this outfit. And it's ALWAYS READY for ordinary digging and loading . . . for drawbar work and bulldozing operations — backfiller blade furnished as extra equipment. Investigate this handy low-cost way of getting "mean" jobs done quickly. See your nearest A-C dealer for further details.

ALLIS-CHALMERS MANUFACTURING CO.
Dept. T-5, Tractor Division, Milwaukee, Wis.
Gentlemen: Please send catalog on Hough Digger-Loader and Model "WM" tractor ☐. Ask your dealer to call ☐.

Name.....

City.....

State.....

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Flood Maintenance And Repair of Levees

Restoration of Levees Damaged by Winter Floods of 1937 Carried on By Forces of U. S. Engineers

✦ DURING the flood of January and February, 1937, on the Mississippi River, considerable emergency topping of low places was deemed advisable to insure against possible overtopping by the rising waters on approximately 5 miles of levee downstream from Hickman, Ky. The difficulty and uncertainty of maintaining this reach of levee was increased by the prevailing high winds creating wave action which eroded the embankment, already softened by heavy rains, and by sand boils and excessive seepage near the land-side top of the embankment. The existing margin of free-board was preserved and increased by the usual methods employed in such emergencies, and the sand boils were prevented from becoming a serious menace by promptly applying the customary treatment as described herein.

High-Water Maintenance

This reach of levee, locally known as the Reelfoot Levee, was constructed to the 1928 project grade and section, having a 10 to 24-foot crown width, 1 on 3½ river-side slope and a variable land-side slope to contain a 1 on 6½ seepage line originating 1 foot below the river-side crown. In sections where the existing levee had been enlarged on the river side, the land-side slopes were 1 on 3 from the crown to an elevation 8 feet below crown grade; then a 40-foot width banquette having a slope of 1 on 20; thence a slope of 1 on 4 from the landward shoulder of the banquette to the natural ground surface.

The United States Engineers, with the C.C.C., W.P.A., and local interests assisting with their forces, increased the grade from 1 to 3 feet and strengthened indicated weak sections where required by the following methods. The raising of the levee was accomplished by laying earth-filled sacks on the levee crown and by construction of mud boxes, consisting of two parallel wooden bulkheads placed longitudinally along the crown of the levee, spaced about 2 feet apart, and filled with earth obtained from the land-side slope of the levee.

Localities where sand boils threatened to become dangerous were ringed with sack wells of such height and thickness as the nature and activity of the particular case required. In some instances it became necessary to construct short sub-levees of earth-filled sacks to enclose areas containing several sand boils or where excessive seepage occurred near the levee toe. This treatment, in impounding the flowing water, created sufficient hydrostatic head to reduce the velocity of flow through the earth sufficiently to prevent movement of material that might endanger the foundation and base of the levee.

Repairs

After the high-water danger had passed, immediate steps were taken by the U. S. Engineers to repair the damaged levee and reinforce the weak sections which had developed. Equipment and personnel used in the construction were hired upon an hourly basis, with engineering and supervision of construction being performed by the regular personnel of the Engineer Department.

The repair work was begun on May 18, 1937, and consisted of placing 48,708 net cubic yards of earth at a total cost of $23,236.61. The construction force worked one eleven-hour shift per day for six days per week. The embankment was completed on July 28, 1937, after which dressing and sodding was completed on Aug. 3, 1937.

The work consisted of raising the crown height of low portions of levee, restoring damaged sections and construction of a land-side false berm 100 to 200 feet in width to cover areas where boils and excessive seepage had occurred.

Borrow pits were established at approximate half-mile intervals on the river side of the levee and behind existing borrow pits. Earth was loaded with a 45-foot boom dragline handling a 1½-cubic yard bucket. The hauling unit consisted of from 10 to 14 steel-bodied 2-cubic-yard-capacity dump trucks with dual pneumatic tires.

The material was dumped continuously across the crown slopes and banquette, then compacted into place with a tractor bulldozer. The surface was then dressed by hand shovels, mule-drawn fresnoes and railroad rail drag. Prior to placing any material, the surface to receive the fill was cleared of all weeds and foreign matter and then broken with a plow to a depth of not less than 6 inches in order to provide a bond with the new material.

The land-side false berm, consisting of a 2 to 4-foot fill and having a gross crown slope of 1 on 50 landward from the levee, was built in a similar manner to the construction described above.

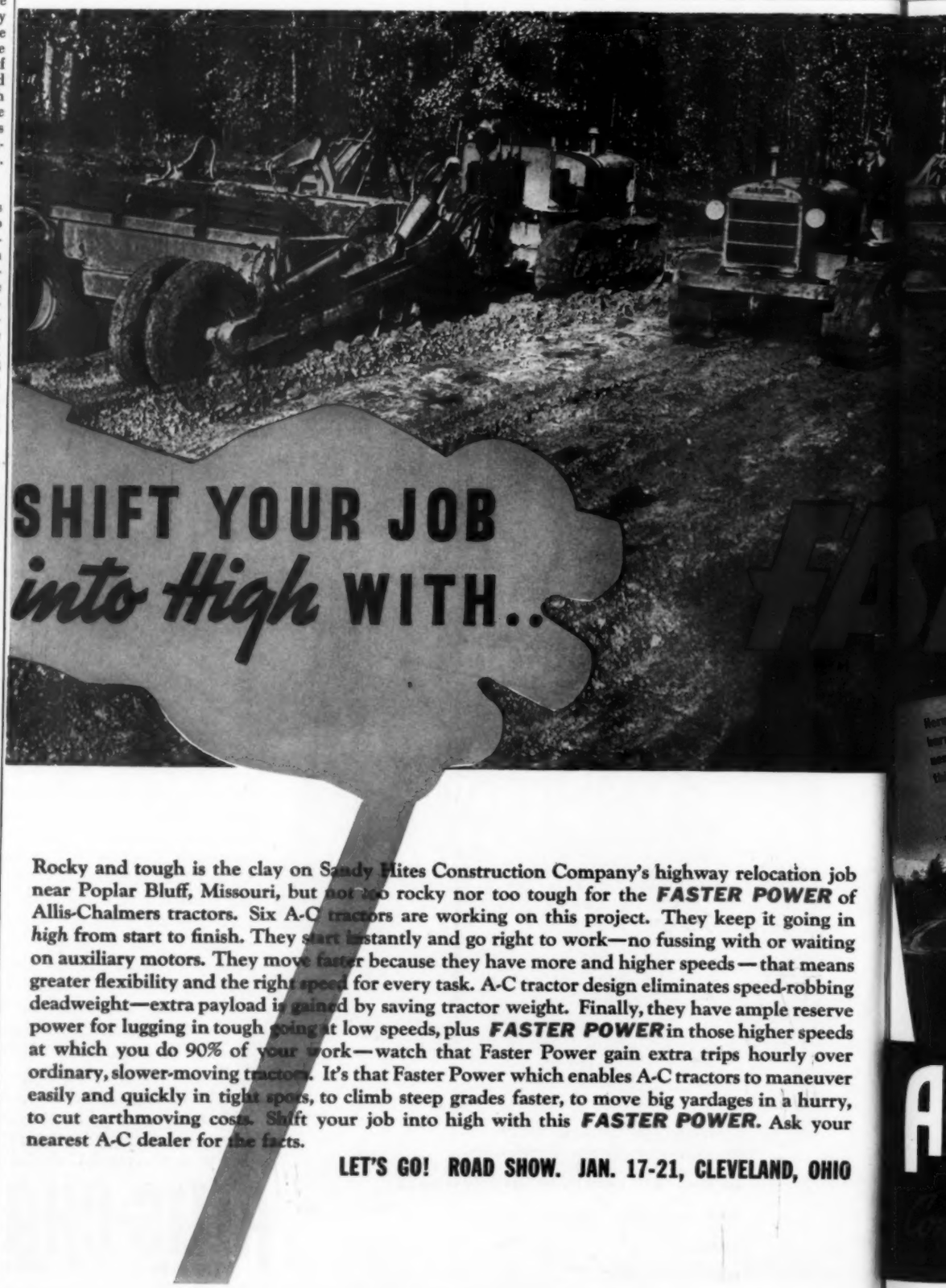
Sodding of all the work was done by placing 4-inch squares of living Bermuda sod at centers of not more than 18 inches and covering to a depth of from 1½ to 2 inches of earth. On long stretches the sod was plowed under, while in small areas, the holes were dug and sod covered with hand tools.

The work described herein extended from Hickman, Ky., downstream for a distance of 7 miles with the exception of 2 miles in the center of the reach.

A.E.D. To Hold Annual Meeting in Cleveland

Just prior to the A.R.B.A. Convention and Road Show, the Associated Equipment Distributors, an organization of the principal distributors of construction equipment throughout the country, will hold their annual meeting at the Cleveland Hotel on January 15 and 16.

New officers will be elected and an interesting program covering the problems of the day will be presented.



Rocky and tough is the clay on Sandy Hites Construction Company's highway relocation job near Poplar Bluff, Missouri, but not too rocky nor too tough for the **FASTER POWER** of Allis-Chalmers tractors. Six A-C tractors are working on this project. They keep it going in *high* from start to finish. They start instantly and go right to work—no fussing with or waiting on auxiliary motors. They move faster because they have more and higher speeds—that means greater flexibility and the right speed for every task. A-C tractor design eliminates speed-robbing deadweight—extra payload is gained by saving tractor weight. Finally, they have ample reserve power for lugging in tough going at low speeds, plus **FASTER POWER** in those higher speeds at which you do 90% of your work—watch that Faster Power gain extra trips hourly over ordinary, slower-moving tractors. It's that Faster Power which enables A-C tractors to maneuver easily and quickly in tight spots, to climb steep grades faster, to move big yardages in a hurry, to cut earthmoving costs. Shift your job into high with this **FASTER POWER**. Ask your nearest A-C dealer for the facts.

LET'S GO! ROAD SHOW. JAN. 17-21, CLEVELAND, OHIO

Improvements in Line Of Drills Announced

The most important improvement in the line of Thor drills recently announced by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., is its new principle of valve operation known as Measured Air. The Thor short-travel positive tubular valve cuts in and out more quickly, admitting a precisely-governed unvarying quantity of air in back of the piston hammer so that it functions perfectly on every stroke.

Other improvements in the Thor line include the W. D. wagon drill which is adjustable as to mast and wheels, with feeding either by gravity or by means of a pneumatic cylinder powerful enough to handle steels in any multiple of 12 feet, the length of steel accommodated by the mast. This drill is equipped with a centralizer which permits collaring a hole quickly and properly. The Thor UB wagon drill is recommended for general rock drilling. It is equipped with the Thor Measured-Air feature. Another feature is the positive automatic lubrication in which air pressure distributes oil to all moving parts.

The improved No. 90 drifter rock drill offers air economy and drilling speed, according to the manufacturer, due to the powerful rotation and the short-travel positive tubular valve.

Complete information on this new Thor equipment is contained in literature which the manufacturer will be glad to send on request to those mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New Sales Mgr. Appointed For Murphy Diesel Co.

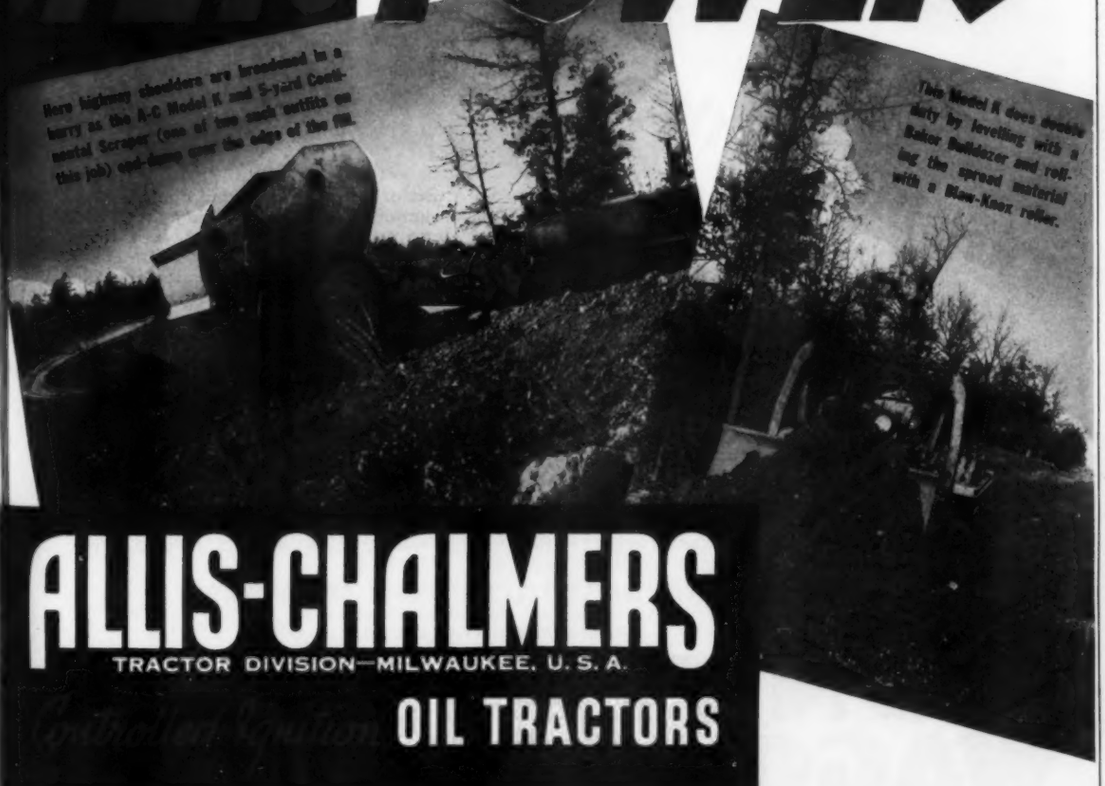
The Murphy Diesel Co., Ltd., of Milwaukee, Wis., has announced the appointment of George P. Hough, who for the past few years has been associated with the construction industry in the manufacture of heavy equipment, as Sales Manager. Mr. Hough, who is a graduate of the University of Minnesota and is a member of the bar, was engaged in merchandising and general manufacturing activities prior to his entrance into the construction equipment manufacturing field.

Two Model L-0's and L-10 Car Wood Scrapers cutting and filling on Sandy Hites' job near Poplar Bluff. Fill is compacted by a Model K and Blaw-Knox roller.

MORE FOR YOUR MONEY FROM

Faster Power When you buy A-C tractors you get more usable power for your money because there is no excess weight to use up power or to figure into the cost. As a result the first cost of ***FASTER POWER*** is lower than that of ordinary tractors. You get more work from your fuel and lubricating dollar, too, because A-C Controlled Ignition Oil Tractors develop a full, even flow of power on *any clean Diesel fuel or furnace oil* — no extra-cost, premium fuels or special lubricants are required. Lower fuel costs, lower first cost, ***FASTER POWER*** — from these you get lower-cost yardages, consequently *more profit.*

FASTER POWER


Here highway shoulders are broadened in a hurry as the A-C Model K and 5-yard Centaur Scraper (one of two such outfits on this job) end-dump over the edge of the fill.
Two Model K dozers double duty by leveling with a Baker Bulldozer and rolling the spread material with a Blaw-Knox roller.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

OIL TRACTORS

One-Man Control For Hot-Mix Plant

(*Continued from page* 1)

The Hot-Mix Plant

The Simplicity System asphalt plant for the production of the base and top courses was located near the south end of the contract close to the edge of Magee, and only ½ mile from an excellent sand pit which provided fine sand for blending with the coarse sand to produce a more stable mixture. The sand was loaded by the Lorain 40 rigged as a shovel, and hauled by a fleet of trucks to a large stockpile at the south end of the plant area where it was piled by a P & H crane and 1-yard Blaw-Knox clamshell bucket.

The asphalt plant was located between two sidings, the one nearer the main track being used for the unloading of sand and gravel from the gondola cars and the siding on the other side of the plant for unloading asphalt, fuel oil, coal and filler dust. Twin feeders of the crawler apron type were used to move the mixed aggregate from the bulkhead piles to the cold elevator to the drier in approximately the proportions required. The double-drum drier with return flow received the material from the cold elevator tangentially and carried it to the far end, 15 feet, and back for delivery to the hot elevator. The drier was 8 feet in diameter.

Double-deck Allis-Chalmers vibrating screens over the bins at the top of the hot elevator sized the material and delivered it to the 4-compartment 35-ton bin. The same elevator carried the fines from the conical-bottom dust collector to the bins at a uniform rate.

A 30,000-gallon asphalt tank and a 20,000-gallon fuel-oil tank at the north end of the plant maintained sufficient supplies for the operation of the plant between the shipments of these materials. A Kinney asphalt pump furnished a continuous flow of hot asphalt from the supply tank to the asphalt heater tank, mounted under the bins on the plant, where the temperature of the material was raised to 275 degrees Fahrenheit. An overflow from the heater tank returned excess pumpage to the storage tank. The storage tank was heated by low-pressure steam in coils and the heater tank by high-pressure steam, likewise in coils.

Two Troy 10 x 10 steam engines provided the power for the operation of the asphalt plant. The first ran the exhaust fan on the drier and the second ran the mixer, the cold and hot elevators, the vibrating screen, and the screw dust conveyors. Complete control of the plant was centered at the operating platform where one man weighed the materials from the four compartments of the bins, the dust, weighed and dumped the asphalt, delivered the batch to the pugmill mixer and dumped the 2-ton batch into the trucks. This latter could not be done until the timing device released the gate. The aggregates and asphalt were weighed by Kron springless dial scales, the batch weights for the various materials being indicated by arrows set on the dials for the different mixes. The plant, which has a capacity of 100 tons an hour, was operated 12 hours a day on this contract with two 6-hour shifts. The 2-ton batches averaged the following composition:

Base Course		Surface Course	
Asphalt	5 per cent	Asphalt	8 per cent
Gravel	62½ per cent	Filler dust	8 per cent
Sand	32½ per cent	Gravel	30 per cent
		Sand	54 per cent

The plant operating crew consisted, at a minimum, of the Foreman or Plant Superintendent, one mixer man weighing materials, one fireman, one temperature man, one asphalt-supply man, one

(*Continued on page* 51)

Soils Studies Save In Highway Costs

(*Continued from page 9*)

The minimum length of a section was 300 feet.

If gravel 6 inches thick had been placed on the entire project for a width of 24 feet, the cost at 60 cents per cubic yard would have totaled $17,600. At the same price per cubic yard the cost by varying the layers would be $9,300, or a saving of $8,300, and there would be 3 inches more base on the weaker sections.

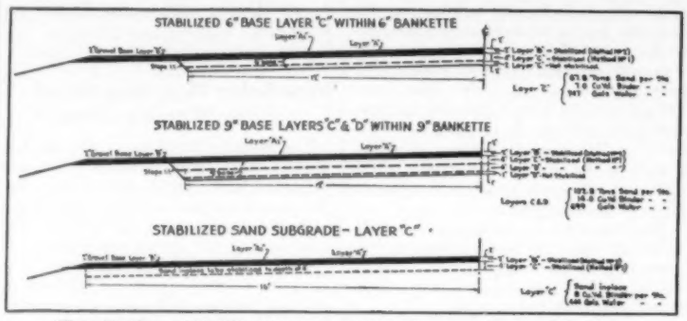
The diagram shows three sections of stabilized bases. These are all prepared for light bituminous-surface treatments as soon as the base has reached the required density. Layers A_1 and A refer to the prime coat and seal coat of the bituminous surface treatment which is 32 feet wide. The gravel base courses are designated as Layers B, C, and D. It will be observed that Layer B is stabilized by Method No. 2, while Layers C and D are stabilized by Method No. 1. In Method No. 2 the best methods of mixing and compacting a graded mixture of mineral aggregate and binder soil are followed. The same care in design and construction is taken as would be taken if a bituminous surface was not to be constructed, the only difference in design being a somewhat smaller amount of binder soil. On the lower courses, however, in addition to using a smaller amount of binder soil, less care is taken in obtaining mineral aggregate conforming to the ideal grading curve. There is always, however, a large percentage of fines.

There is some question among our soils engineers as to the ultimate effect of capillary water where the construction is on capillary soils. The bituminous surface in preventing evaporation may result in a gradual softening of the base. Observation shows, however, that our best results with light bituminous treatments have been where there were compacted gravel bases. A cooperative field research project on this problem is now under way.

Soils Surveys Precede Grading

It soon became apparent, when the studies of gravel bases were under way, that more attention should be given to the selection and placing of soils during grading operations. It is difficult to maintain a smooth-riding flexible surface when the type of soil in the upper portion of the roadbed is variable. Then, too, the gravel surface could be made thinner if soils were carefully selected and compacted in order to get uniformity and density in the upper foot or two of the roadbed.

Whenever trained soils engineers are available, we now make a complete soils survey prior to making final plans for a grading job. The soils engineer is furnished a plan and profile showing the proposed alignment and grade line. The center line is staked out. By means of augers, the soils engineer locates the various layers of soil, and maps the soil profile. A study of this may show that it is advisable to shift the grade line in cuts so as to get good subgrade soils, or if this cannot be done, the construction plans may call for excavating in cuts below the grade line and backfilling with suitable material. Occasionally the alignment is changed. A study of the soil profile will also show how excavated materials should be placed so as to get good soils at the top of the grade. This can be provided for in the construction contract. When good soils for the top of the grade cannot be obtained from the cuts, it is usually advisable to get them from borrow pits. The soils engineer locates and maps the soils in the borrow pits.


STABILIZED 6" BASE LAYER "C" WITHIN 6" BANKETTE
STABILIZED 9" BASE LAYERS "C" & "D" WITHIN 9" BANKETTE
STABILIZED SAND SUBGRADE - LAYER "C"

Three Sections of Stabilized Bases for Light Bituminous Surface Treatment

On a recent project, a top layer of 9 inches of selected clay loam soil to be placed over the silty soils generally occurring in the grade was obtained from borrow pits. The total cost of the clay loam and gravel surfacing for the project was estimated at $20,130, whereas the estimated cost for gravel base and surfacing construction otherwise was $24,330. The lower cost design is considered just as satisfactory as the more expensive one.

Locating Frost-Heave Areas

In addition to obtaining information upon which to base variations in base thickness, the soils engineers also locate places where frost heaves and the resultant frost boils are likely to occur. Unless it is possible to avoid these places by change of alignment or grade, or to provide a cure by drainage, the offending soil is removed to a depth of from 24 to 42 inches and replaced with soil which does not have such favorable capillary properties for the formation of ice lenses. This is usually necessary on only a small percentage of the length of the improvement, but is essential if hazardous heaves are to be avoided during the winter and impassable quagmires during the spring break-up.

New Bulletin Issued on Portable Batchers

A new Bulletin S-18B titled "When We Say Portable, We Mean Portable!" has recently been issued by Heltzel Steel Form & Iron Co., Warren, Ohio, describing in considerable detail and showing photographic illustrations as well as dimensioned plans of Heltzel Types 1, A and B complete portable batching plants as well as details on Heltzel batchers with dial or steam scales.

A 10 yard Continental Wagon Scraper and Allis-Chalmers Tractor ripping up an old black top road without scarifying—Continentals do it all the time!

They DIG—as they LOAD—as they HAUL—
and Back Dump Like a Truck!

DON'T MISS THE NEW CONTINENTALS AT THE ROAD SHOW BOOTH B-13

A turn of the hydraulic control lever and the Continental's sharp-edged cutting blade digs in—the full weight of the entire unit is behind it—it hogs out everything it goes after! It loads as it digs, the dirt smoothly sliding up and into the front carrying apron and body—no resistance, no obstruction—full loads on every trip!

While it is digging and loading it's also hauling—it's on its way to the dump! Only Continentals back dump like a truck—operating as smoothly backward as forward—backfilling is easy—they windrow dump—stock pile—level and grade. They turn short and dump in close quarters. They dig anything the tractor can pull through—rocks, imbedded roots, gumbo. They're light, fast, rugged, easy on the tractor, easy on the operator, and easy on the maintenance man! If your present equipment can't match this performance, then it isn't worth a Continental!

Continental offers a complete line—4, 5, 7 and 10 yard sizes with balloon-tired wheels; and 5, 7 and 10 yard sizes mounted on crawlers.

Continentals perform the greatest number of dirt moving operations at the lowest cost per yard. For 1938—don't overlook Continentals—look them over!

Sold by Allis-Chalmers dealers everywhere.

Continental Features:

1. Lightest in weight, yet strongest!
2. Simplest in design and all working actions!
3. Require less tractor power!
4. Backfill entirely over a bank!
5. Dump in close quarters!
6. Turn short and back easily!
7. Load, dump and haul faster!
8. Used for spreading and grading, too!

CONTINENTAL ROLL & STEEL FOUNDRY COMPANY
Tractor Equipment Division
Railroad Avenue • East Chicago, Indiana

CONTINENTAL WAGON SCRAPERS

GALION Enters 1938 with Many New Developments . . .

The large view at the left shows the big Master model motor grader with diesel power unit. It has a new and more powerful scarifier, more powerful lifts, new 3-passenger cab, longer blade base and better distribution of weight. You will want to see this unit at the Road Show.

Reading from top to bottom, the smaller views are: trench roller, portable roller, 12-ton "Chief" roller, tandem roller, and the redesigned highway sander. All of these units will be on display for your inspection.

When the curtain goes up for this year's Road Show, Galion will be ready with seven road building and maintenance units which have more new and improved features than we have space to mention here. The big Galion Master model motor patrol grader and the No. 120 leaning wheel grader, particularly, have an array of developments never before available on machines of this type.

We hope you can attend the Show . . . we want you to visit the Galion exhibit so that we can point out the many advantages of the Galion line for 1938. *See the difference.*

The Galion Iron Works & Mfg. Co.

Main Office & Works — **Galion** — **Ohio**

Export Division — **Columbus, Ohio**

Proper Terminology in Bituminous Road Work

The Committee on Developments in Fundamentals of Bituminous Construction, J. E. Buchanan, Chairman, presented a report at the 1937 Montana National Bituminous Conference on the terminology to be used in bituminous construction. The report brings out that the terminology today is confusing and a need for standardization is apparent. This was expressed by Hveem of California as follows:

"If all pavements composed of mineral aggregate bound together with some asphaltic product were considered under the one heading of bituminous mixtures, I do not doubt that we would have fewer differences of opinion as to what constitutes fundamentals."

For the purpose of offering something to "shoot at" the Committee has presented two groups of definitions, the first under "aggregate" and the second under "bituminous surfaces." *Coarse aggregate* is defined as aggregate containing particles larger than ¼-inch. *Fine aggregate* is defined as aggregate containing particles smaller than ¼-inch. *Macadam aggregate* is a coarse aggregate consisting of fragments of substantially one size, or a limited range of sizes, the smallest of which is ¼-inch. *Graded aggregate* is aggregate containing proportions of particles of all sizes from the maximum size to dust. *Open-graded aggregate* is a graded aggregate with a limited proportion of particles passing a No. 10 sieve and not more than 5 per cent passing a No. 200 sieve. *Dense-graded aggregate* is a graded aggregate with a continuous representation of all particle sizes from the maximum size to dust, and containing between 5 and 15 per cent passing a No. 200 sieve.

Two definitions appear under the subject "Bituminous Surfaces." *Surface treatment* is any bituminous surface which has a final thickness less than one inch. A *bituminous pavement* is any bituminous surface which has a final thickness greater than one inch.

Barrett Tarvia
GOOD ROADS AT LOW COST

See Tarvia Exhibit National Road Show, Cleveland, Ohio, January 16-21. Booth D-34.

THE BARRETT COMPANY New York Chicago Birmingham St. Louis Detroit Buffalo Providence Lebanon Rochester Baltimore Minneapolis Cleveland Columbus Philadelphia Toledo Youngstown Syracuse Hartford Boston Milwaukee Cincinnati Bethlehem Portland, Me. Norwood, N. Y.
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America's Leading Manufacturer of Coal-Tar Products
ROOFINGS • WATERPROOFING • TARVIA • CHEMICALS

Many Novel Features Of Memphis Overpass

Flexibility of Plant, Forms and Form Clamps Well-Planned for Job By Hickman & Long

(*Photos on page 56*)

✦ WHEN a man on a Hickman & Long project says that he can do a job in a certain length of time, "J. M." tells him to go ahead and do it. On the Jackson Avenue overpass in the Binghamton District north of the heart of Memphis last summer Jack Nicholson said he could alone cast, rub and stack three gang molds of ten spindles each a day and the answer was "Go ahead." So the 4,156 spindles were produced by Jack as his contribution to the structure. It looked like an endless task offhand to complete in the 300 working days of the job but the spindles were ready long before they were needed for 30 a day meant only 139 days to finish the job. A one-man job on the spindles means uniform rubbing and the same amount on every spindle. He cared for them with all the tenderness of a Dr. Dafoe for his "Quints," only remember there were 4,156 of them.

Sufficient gravel and sand was stockpiled off the right-of-way alongside a 2-bag Dandie mixer and beside a shed under which the three simply-constructed gang molds were set on a wood platform. A Johnson Bantam batcher insured the right amount of aggregates for each batch, and the attention of Jack Nicholson insured that they would be uniform. He first stripped the three molds cast the day before, then poured them again and then set about rubbing the thirty 24-hour-old spindles and set them up on the stack, covered them with burlap and sprinkled them for curing. That was his day's work, and it totaled 4,156 spindles before they were needed.

Plan of Structure

The Jackson Avenue overpass at its east end crosses the Illinois Central and Louisville & Nashville tracks, and the Union Belt Line switch and three sets of main tracks at the west end with provision for two proposed tracks. It is interesting to note that the three bents on the Union Belt Line's shunting tracks are equipped with collision walls and the bents adjacent to the fast tracks of the Illinois Central and L & N are not so protected.

At the east end of the structure the concrete pavement of the roadway is reduced in width from 54 to 40 feet in a distance of 110 feet. There is provision at each end for two side roads or service roads to the railroad yards and side streets. The viaduct itself is 1,595 feet in length and is on a tangent. The structure is built on pile foundations with individual footings for the pairs of reinforced concrete columns supporting the caps and deck and girder roadway section. Starting at the west end of the structure there are 18 spans of 28 feet 6 inches each, one span of 39 feet to provide space for a turn-around on the service road below the viaduct, one span of 32 feet 7¾ inches which starts the skew of the bents caused by the angle of the railroad tracks beneath the overpass, two spans of 55 feet for the Union Belt Line tracks, six spans of 40 feet 7 inches, one span of 43 feet over the I.C. and L. & N. tracks, one span of 39 feet 11 inches, one span of 43 feet for the east-end service roads, one span of 34 feet 10 inches taking the skew out of the bents, and 16 spans of 28 feet 6 inches to the east abutment.

There is 255 feet 3 inches of retaining wall at the east end and 62 feet 3 inches of wall at the west end. These are straight reinforced concrete walls, 1 foot thick with a 2-inch coping at the top. Copper expansion joints are inserted at approximately 30-foot intervals. The skews for the streets and tracks vary from 68 to 72 degrees 30 minutes. In this contract also are two bridges with five 28-foot 6-inch spans and 20-foot roadways and 5-foot sidewalks over Cypress Creek in connection with the service roads at the west end.

Typical Bents

Typical bents for the 28-foot 6-inch spans have pile foundations consisting of five or more, as required to secure the proper bearing, precast concrete piles made on the job by the general contractor, Hickman & Long, and driven by the Raymond Concrete Pile Co. as subcontractor. The piles vary from 14 to 40 feet in length and are 14 inches in cross section.

The footings are 6 feet 6 inches square for each of the two columns in each bent and are 2 feet high. In the next foot of elevation, the cross section is reduced to 3 feet square on which the 2-foot square column is carried. The footings are reinforced with ⅝-inch round bars on 6-inch centers both ways and hooked at the ends. There is no reinforcing in

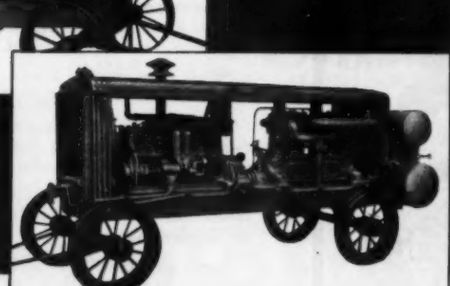
(*Continued on page 42*)

UNIVERSAL ARC Welders • STURDY DEPENDABLE

Universal Power Corp.
4300 Euclid Ave. Cleveland, Ohio

Shown at the Road Show
Used the World Over

COMPRESSORS
ROCK DRILLS
PNEUMATIC TOOLS



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SALES AND SERVICE BRANCHES ALL OVER THE WORLD
6 EAST 44th STREET
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Manufacturers of • AIR & GAS COMPRESSORS • ROCK DRILLS
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PNEUMATIC TOOLS • VACUUM PUMPS & CONDENSERS
OIL WELL ROCK BITS, REAMERS & TOOL JOINTS

CHICAGO PNEUMATIC

THE NATIONAL CARBIDE V-G LIGHT

Gives you daylight conditions on night jobs.
Spreads a full, even beam of 8000 candlepower right where you need it.

Lights up the job for twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. Is easily handled by one man; has nothing to get out of order; no harm done if it tips over—just stand it up again, and it goes right on working. Weight 35 lbs. empty; 98 lbs. when full.

Write for catalogs on V-G Light, V-G Handy Light and Lanterns

X-100

NATIONAL CARBIDE CORPORATION
LINCOLN BLDG. NEW YORK
(Opp. Grand Central)

A Sea-Going Tractor and Earth-Boring Machine Boring Holes for Bulkhead Piles

Tractor at Sea On Unusual Job

When a tractor goes to sea that's news. The particular tractor we are telling about did not go to sea in a freighter nor even a barge; it barged out into the sea itself and started boring holes in the blue marl into which it was impossible to drive piles for the bulkhead construction.

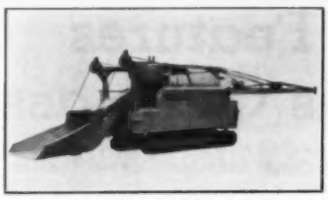
Brundage & Crandell Co., general contractor of Sudley, Maryland, was awarded the contract for building a shore-protection bulkhead at North Beach Park, Md., on Chesapeake Bay. About 4 feet from the surface they encountered the blue marl and since the piles would not penetrate it, they purchased a Highway earth-boring machine mounted on a Caterpillar tractor and bored every hole, some of them in 24 inches of water, resulting in unusual scenes such as illustrated.

The bulkhead is a little over 8,000 feet in length and is built with treated timber. It was designed by John A. Bromley, County Road Engineer of Anne Arundel County. The earth boring machine bored 16-inch holes 9 feet deep at the rate of about 50 holes about every eight hours and the total fuel consumption for moving the tractor and driving the earth-boring machine from the power take-off was about 15 gallons per shift.

Paraguay Builds Road As Link to Atlantic

The government of Paraguay has contracted with an American concern for the construction of a highway from Asuncion to the Iguassu Falls on the border of Paraguay and Brazil, the cost of which will be defrayed through a road tax, additional taxes on gasoline and lubricating oils, as well as other sources of revenue in connection with automobile traffic. At Iguassu the highway will link up with the new road on Brazilian territory, affording Paraguay a land outlet to the Atlantic Ocean.

The U. S. Bureau of Foreign and Domestic Commerce reports that the Paraguayan government is also considering a project to contract with another firm for the erection of a cement plant in that country. The amount to be expended for cement in the Paraguayan highway, 251 miles in length, is placed around $1,500,000.



The New Rex Dual Drum Paver

New Dual Drum Paver With 6-Cylinder Motor

The new 34-E dual drum paver of Chain Belt Co., 1666 W. Bruce St., Milwaukee, Wis., has a capacity of 34 cubic feet and is capable of putting out a batch of this size every 40 seconds because of the dual drum feature. It is equipped with a 35-foot super highway boom and is powered by a 6-cylinder motor. Like the Rex 27-E and all other pavers, it is mounted on crawlers. It incorporates in its construction the Rex Mechanical Man which automatically controls the mixing and discharging of the concrete.

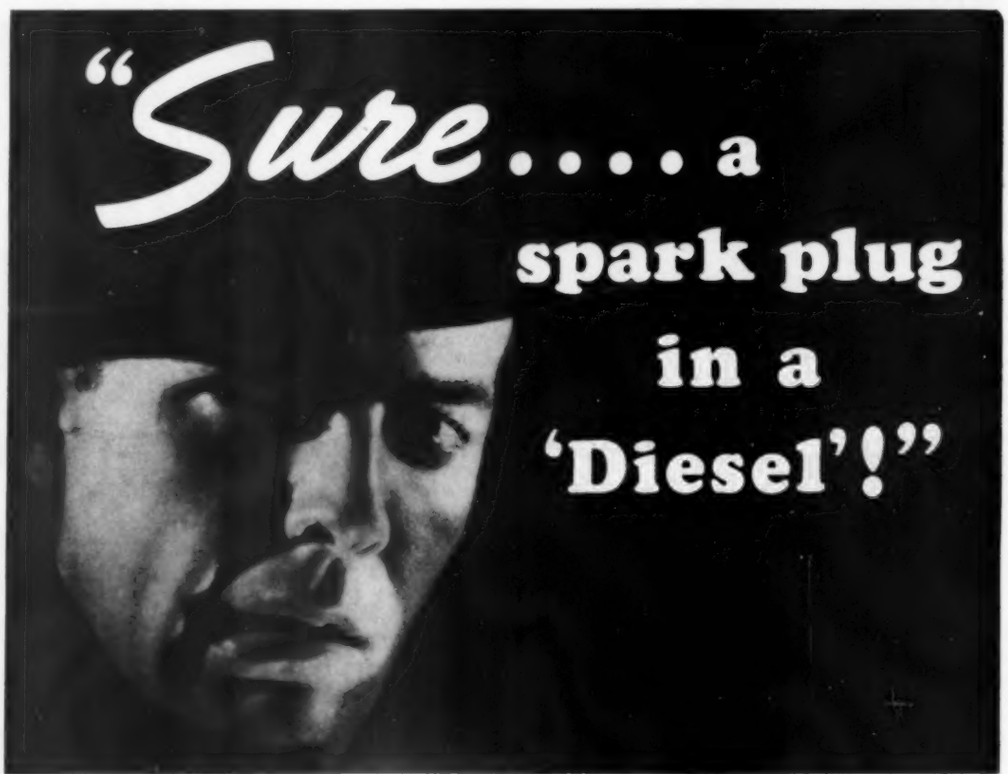
The new 34-E is streamlined. Because of its size, speed and boom lengths, this paver is particularly adapted to the construction of the super-highways which are now being planned in increasing mileage to take care of the demands of the increase in motor traffic.

Pioneer Changes Name

The name of the Pioneer Gravel Equipment Mfg. Co., of Minneapolis, Minn., was changed on January 1 to Pioneer Engineering Works, Inc., in order to convey more accurately the correct nature of the business carried on by this firm which for years has been engaged in the engineering and manufacture of screening, crushing and loading machinery for use in stone quarries, gravel pits, mines and large construction projects.

There is no change in the organization, corporation or personnel.

ROAD MATS
TARPAULINS
WINDBREAKS
CONTRACTOR SUPPLY DEALERS in every state sell the FULTON LINE. Ask for SNUREDRY and FULTEX Tents, Tarpaulins and Windbreaks—anything made of canvas. Also Road Mats and burlap. You buy quality products at fair prices when you buy the Fulton Line.
Write our nearest plant today for catalog, samples and price list.
Fulton Bag & Cotton Mills
Manufacturers Since 1870
ATLANTA ST. LOUIS DALLAS
MINNEAPOLIS BROOKLYN NEW ORLEANS KANSAS CITY MAN



In the "plain English" of John Q. Public, if an engine burns heavy fuels . . . injected cold . . . it's a "Diesel." Let the technical man quibble and limit the term to high pressure compression ignition engines . . . "So what?" says this shovel operator. "I know what I want."

By using a spark plug instead of great pressure to ignite the fuel, that famous Swedish engineer, Hesselman, obtained many important advantages—all found in Waukesha-Hesselman Engines . . .

Spark plug ignition starts a Hesselman Engine easier than a gasoline engine because compression pressures can be moderate.

Spark plug ignition is *precisely timed*, not spontaneous . . . excessive cylinder pressures can't build up, thus bulky frames and flywheels are eliminated. Snappy acceleration is a Hesselman by-word.

Spark plug ignition sees all fuels in the same light—even those hard-to-fire oils that are dynamite to compression ignition engines. There is no ignition lag.

Spark plug ignition makes mechanical up-keep low, because both compression and combustion pressures are moderate. Cylinders, bearings, crankshafts are under no violent shock reversals.

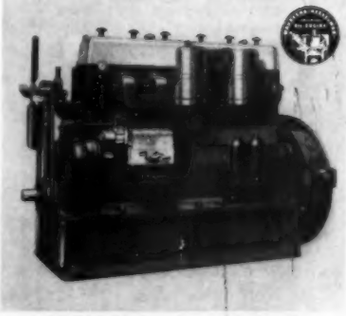
Aren't all these advantages—easiest starting, snappy performance, safe working pressures, and low up-keep—worth more than a few additional gallons of 7¢ fuel oil a day? Waukesha-Hesselman Oil Engines show the *greatest over-all economy*. Actual records of their operation over thousands of hours prove it. The whole story is told in Waukesha Engineering News Record No. 5—write for a copy.

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN

NEW YORK • TULSA • LOS ANGELES

THIS IS NO. 1 OF A SERIES ON THE WAUKESHA - HESSELMAN ENGINE

WAUKESHA ENGINES



THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD
ALL STEEL HAND HOIST
SEATTLE, U.S.A.
COMPACT—POWERFUL—SAFE
"For use where power is not practical or available"

Manufactured in 2, 5 and 15-Ton Sizes. For capacity comparison, ½" cable used:

2-Ton "Lightweight"	75 ft.
5-Ton "General Utility"	250 ft.
15-Ton Triple-Geared "Special"	1200 ft.

Patent instant gear change and positive internal brake that never fails, and will lock load.

Gear Ratios	Weight	Price
2-Ton 4 & 22 to 1	60 lb.	$50
5-Ton 4 & 24 to 1	110 lb.	$75
15-Ton 4, 19 & 109 to 1	680 lb.	$200

BEEBE BROS.

2724 6th Ave., So., SEATTLE, WASH.
Warehouse stocks for dealers' Supply: Seattle—Chicago—Brooklyn—Houston. Complete Literature and List of Dealers in Principal U. S. Cities and Foreign Countries Gladly Mailed.

Brazil Plans Highway To Extend North From Rio

According to press dispatches, General Rabello, Director of the Engineering Department of the Brazilian Army, is working on plans for starting work in the near future on the Rio de Janeiro-Fortaleza Highway project, which will serve both economic and strategic military purposes. Because of the mountainous character of the eastern section of Brazil between Rio de Janeiro and Fortalezn or Ceará, it is reasonable to expect that the greater portion of this highway will be near the coast and will pass either through or near the cities of Campos, Bahia, Pernambuco, and Natal.

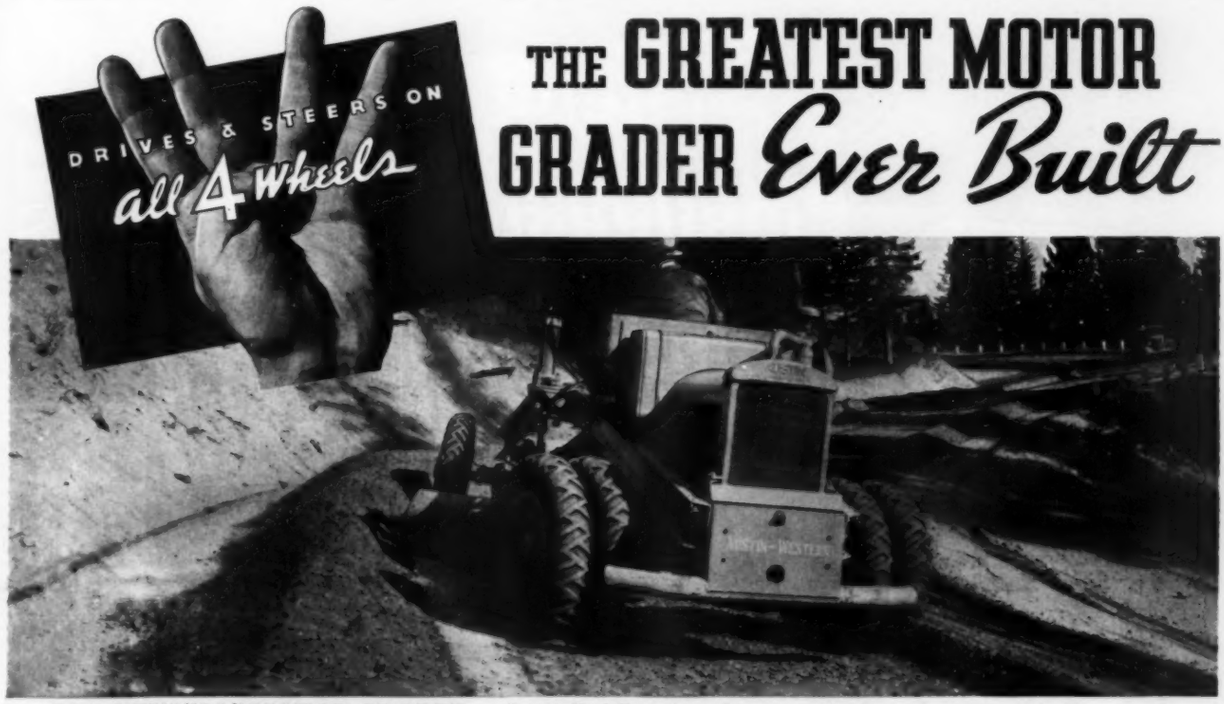
The length of this national highway is calculated at 1,864 miles. It is understood that around 746 miles of existing highway built in accordance with technical conditions acceptable for military purposes will be utilized, and that about 497 miles of various municipal highways will be adapted, with slight improvements such as grading, to the highway planned by the Engineering Department of the Army. This leaves around 621 miles of new road to be built through zones which at present have no communication facilities with the principal centers of the country. Besides providing military defense advantages, this important undertaking when completed, according to the U. S. Bureau of Foreign and Domestic Commerce, will bring an immense area of national territory into communication with market outlets.

1938 Model Excavators

The new line of 1938 excavators announced by the Marion Steam Shovel Co., Marion, Ohio, consists of 1½, 1¾, 2 and 2½-cubic yard machines. The major features of these machines include self-cleaning, non-binding crawlers which are longer and wider; large-diameter supporting axles; "live" roller circles between the upper and lower frames for more even load distribution; anti-friction bearings at all major points; large diameter rotating clutches; and an independent chain crowd.

Maximum operating speed is secured with a proper balance of machinery units, conveniently arranged operating levers, clear vision for the operator and by easily actuated large diameter clutches. Low maintenance has also been featured in these new Marions. The propelling gears are sealed against dirt and operate in oil; the chain drive reduces wear on the propelling sprockets to a minimum; and fewer wearing parts are used with no propelling power transmitted through the rear axles.

Marion feels that its new 1938 line represents the modern trend of more yardage in less time with greater ease and a maximum degree of dependability in performance, operation and service.



THE GREATEST MOTOR GRADER *Ever Built*

THE NEW "99" MOTOR GRADER EXCEEDS *ALL* PREVIOUS STANDARDS OF PERFORMANCE

Discard all former ideas of motor grader capacity and stamina. The A-W "99" . . . embodying All-Wheel Drive, All-Wheel Steer, Controlled Traction, Stabilized Frame, Precision Side Shift, and other equally revolutionary features . . . will handle countless jobs far better than conventional motor graders—handle many jobs a motor grader has never done before.

All-Wheel Steer: The "99" can turn around on a thirty-foot grade in ⅓ the time required by conventional machines, backing up only once. It works around the sharpest "S" curves without stopping, because front and rear wheels can be steered separately, or in unison, in the same or opposite directions, and the operator can control his cut easily and surely.

On heavy maintenance and oil mix, frame can be offset—front wheels travel inside the windrow, giving a full view of the work.

All-Wheel Drive: The "99" will move a heavier load on the blade and move it farther. It will plow deeper ditches and cut straighter ditch lines. With power delivered to every wheel it can operate efficiently in sand, wet clay or mud.

Controlled Traction: One reason for the extraordinary output of the "99" is its ability to make full use of its Four Wheel Drive Traction.

When moving a load on the blade, the operator places the front wheels directly ahead of the heel of the blade, and the rear wheels behind the toe. In this offset position, the pull of the front and push of the rear wheels fully counteract side thrust of the material on the blade.

Stabilized Frame: The design of the "99" eliminates frame twist. The blade holds the floor of the road, even on 30 degree curves—no gouging at the toe or wasting at the heel.

Precision Side Shift: The operator can shift the blade under the heaviest load without changing the blade angle and without gouging. The circle remains in its fixed position—the blade slides on the arms by hydraulic power. This sliding action of the blade side shift keeps the entire blade on the floor of the road whether on a super-elevated curve, in a ditch or on any other work.

The "99" is the most useful machine on any highway job. In addition to the regular work of grading, ditching, oil mix, scarifying, its extra stability and traction make it an effective tractor unit for snow plowing, bulldozing, etc.

6 BASIC *Performance-Improving Features*

1. ALL-WHEEL DRIVE
2. ALL-WHEEL STEER
3. CONTROLLED TRACTION
4. STABILIZED FRAME
5. PRECISION SIDE SHIFT
6. FULL HYDRAULIC CONTROLS

Write or mail the coupon for the "99" Catalog No. 1710.

AUSTIN-WESTERN

THE AUSTIN-WESTERN ROAD MACHINERY CO.
1815 Harrows Street, Aurora, Illinois
Please send me your new "99" Motor Grader Catalog No. 1710.

Name .....
Address ..... State .....
City .....

Steel Bridge Deck Tested for Skidding

A reduction in skidding accidents on slippery bridge surfaces is possible through the use of steel decking of the open-mesh type. This was indicated by a series of tests recently conducted on two bridges at Toledo, Ohio.

The surfaces of both bridges were thoroughly wet previous to the tests, which consisted of a demonstration of the ability of automobiles to make quick stops without skidding on the Cherry Street Bridge, which has an open steel deck, and on the St. Clair Street Bridge, which has a deck of another type.

On the Cherry Street Bridge, the lead car made a series of quick stops, and the car following it was able to avoid accidents. The decking provided a sure non-skid grip for the tires. On the St. Clair Street Bridge, a reproduction of the same traffic situation resulted in a series of crashes with both cars skidding.

The bridge decking supplied for the Cherry Street Bridge by Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa., consists of a mesh-work of riveted steel bars laid on edge. The openings between the bars of this Blaw-Knox Irving decking are so designed that they give a maximum of non-skid surface for motor traffic and provide a satisfactory footing for pedestrians and animals. Snow and ice do not stay on the surface of the new type of decking which further increases the safety factor in winter weather. The lightness of the material has made it possible to increase the traffic load and to decrease the dead weight of many bridge structures.

St. Louis Super-Highway Fully Sodium Lighted

The new super-express highway 3 miles long at St. Louis, Mo., is now lighted from end to end with General Electric sodium-vapor lights. The lighting installation was recently completed, using more than 100 units with 10,000-lumen sodium lamps.

Orange-yellow sodium lighting is also provided on the Kansas City, Mo., intercity viaduct, on the McKinley Bridge in St. Louis, and at Hannibal, Mo.

Standard Automotive Engineering Service
BOOSTS MILEAGE 1.1 MILES PER GALLON
for this Motor Coach Company
STARTLING as this figure may be, the saving is not unusual where Standard Automotive Engineers have worked with fleet operators.
This intra-city bus company operates about four hundred thousand miles per month. When the Standard Automotive Engineer was given permission to work with the maintenance department, the Company was averaging 3.9 miles per gallon on the fuel it was using, with one year this figure had been raised to 5.0 miles per gallon and has stayed at or near that mileage for the past six months.
Standard Automotive Engineering is not a "one time" service. These engineers work with your maintenance department—locating inefficient motors and adjusting them to get the full power out of the fuel. They have scientific instruments for testing—they know gasoline and lubricants from the ground up.
There's an Automotive Engineer in your local Standard Oil office. Call him in. Let him explain just how this service and Standard Oil products can save you money just as they are for this motor coach company. Phone him today.
Copr. 1938, Standard Oil Co.
LOWERS MILEAGE COSTS
STANDARD OIL COMPANY (INDIANA)
AUTOMOTIVE ENGINEERING SERVICE

Cold Weather Cautions For Concrete Foremen

Assuming that all contractors know what to do in the way of precautions against damage to concrete by freezing, we are listing below some information which they may want to clip out and hand to their foremen to reinforce other written or verbal instructions. It is well known that fresh concrete takes a longer time to set unless artificial heat is used, and that concrete should always be maintained at about 50 degrees Fahrenheit. The speed of setting increases as the temperature is increased. Another pointer is that the less water used, the quicker the concrete mixture sets up.

Mix Dry and Near Forms

Thorough mixing permits the use of a minimum water content to obtain the proper strength of concrete. Put the mixer just as close to the forms as you can to speed the time between the mixer and getting the concrete into a confined space. When the concrete is put into the forms, it should have a temperature from 60 to 90 degrees Fahrenheit.

Heated Aggregate and Hot Water

Both the aggregate and the mixing water should be heated to insure the 60-degree temperature for the concrete when it leaves the mixer. To accomplish this, the aggregate must not be below 40 degrees and the water should be about 180 degrees. Don't put any frozen aggregate into the mixer; thaw it out first. A perforated culvert pipe beneath a pile of aggregate makes one of the best heaters for stone and sand. A torch-type burner placed in the pipe is the cleanest and quickest way of furnishing the heat, but be sure to block up the far end of the pipe, permitting only a small space for the heat to escape. There are plenty of water heaters available on the market or one can readily be made up by running a coil of pipe through a perforated oil drum, in which a moderate fire is maintained or another torch-type burner is inserted.

Handling and Protecting Concrete

Be sure that the forms are entirely free of ice and snow. If any has gathered before it is time to place the concrete, a torch burner will melt it out quickly. The concrete should be moved from the mixer to the forms as quickly as possible to prevent unnecessary loss of heat.

For protecting the concrete salamanders, tarpaulins and straw are among the best, although manure is sometimes used. If the concrete is enclosed with tarpaulin or even a wooden structure, don't let the air become too dry through the use of salamanders. Keep the air moist either by admitting steam to the enclosure or permitting water to evaporate from a can placed on top of a salamander.

Proper Temperature

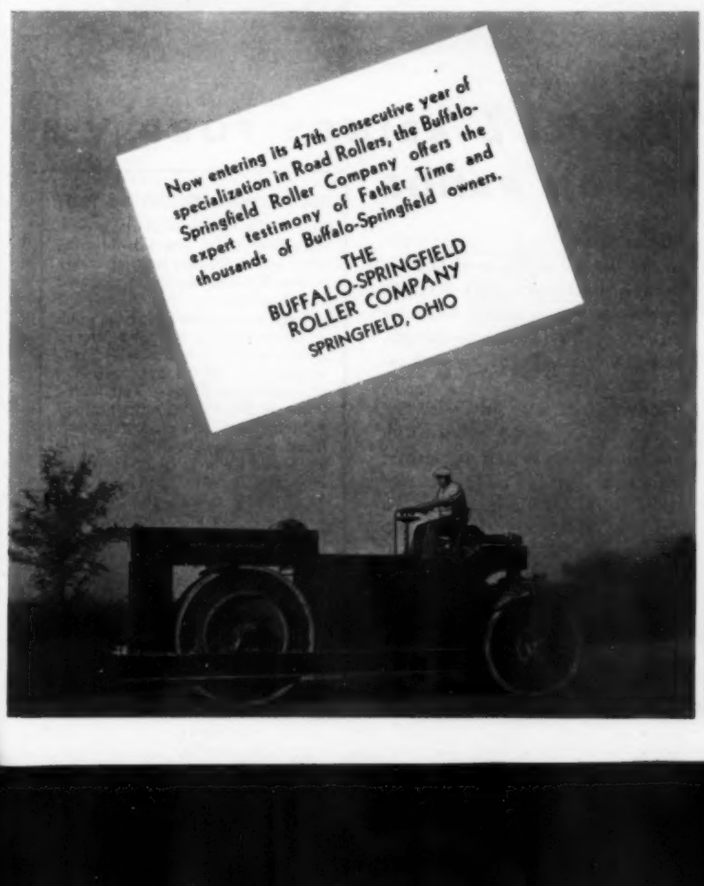
For surface construction work like roads, sidewalks and warehouse floors, keep in mind the following points:

1. When the temperature is not below 40 degrees the concrete should be placed at 70 degrees and the water heated to not above 180 to 190 degrees F.
2. When the temperature is between 20 and 40 degrees F. the concrete should be placed at 80 degrees F. The subgrade or forms must be free of frost and for best results the water and stockpiles should be heated and a torch-type heater attached to the mixer.
3. For temperatures below 20 degrees the concrete should be placed at 90 degrees F. using a water heater, concrete heater and heated aggregate.

New Line of Drills For Electric Power

To meet the drilling demands for modern labor saving electric tool equipment, Syntron Co., 227 Lexington Ave., Homer City, Pa., has brought out a complete new line of portable electric drills, the first of which is the ½-inch capacity Model No. 12-S drill of streamline design with all corners rounded off so as not to catch on the operators' clothing. Sturdy cross-bar handles, together with an end spade handle, provide easy operation. The aluminum shell houses a powerful universal electric motor. The reduction gears are all of heat-treated chrome molybdenum steel, ball-bearing mounted. The 3-jaw geared Jacobs chuck accommodates up to a ½-inch straight-shank drill bit. This drill on the larger sizes is well adapted for outside rough construction service.

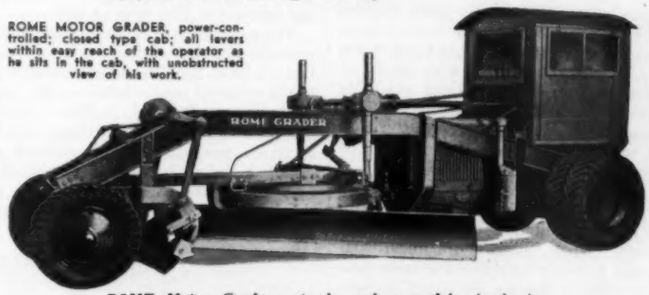
This and other electric drills, grinders, screw drivers, sanders and hacksaws are completely described in Bulletin 231, which may be secured from the Syntron Co., by mentioning this magazine.


Now entering its 47th consecutive year of specialization in Road Rollers, the Buffalo-Springfield Roller Company offers the expert testimony of Father Time and thousands of Buffalo-Springfield owners.
THE
BUFFALO-SPRINGFIELD
ROLLER COMPANY
SPRINGFIELD, OHIO

• ROME •
MOTOR GRADERS

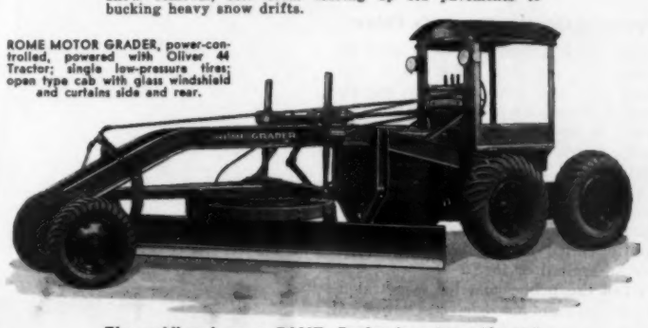
When judging and comparing road building machinery, consider the standards of quality that have brought ROME Graders into so prominent a place. After all, the finished grader is made up of *assembled details;* and it is the character and perfection of these details that give ROME equipment its outstanding leadership.

ROME MOTOR GRADER, power-controlled; closed type cab; all levers within easy reach of the operator as he sits in the cab, with unobstructed view of his work.



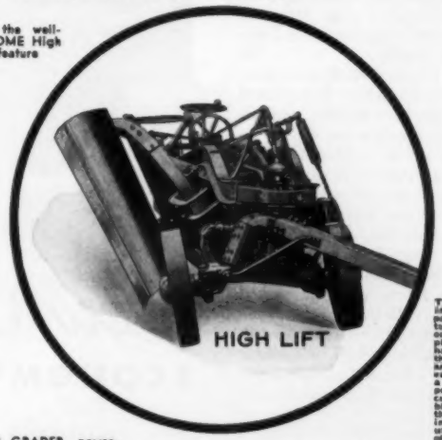
ROME Motor Graders—sturdy and powerful, simple in design, rugged in construction, easy to handle, economical to operate—are always ready for all kinds of road work:—leveling, scarifying, scraping, grading, ditching, rooting, snow removal, etc.—from tearing up old pavements to bucking heavy snow drifts.

ROME MOTOR GRADER, power-controlled, powered with Oliver 44 Tractor; single low-pressure tires; open type cab with glass windshield and curtains side and rear.



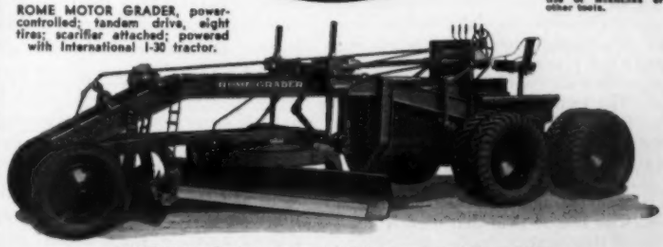
The moldboard on a ROME Grader is extra wide and properly concaved so that it rolls the dirt, rather than pushes it; and is so curved as to free itself from dirt at all times. Its extra width, strong construction and proper design make it unusually effective and efficient, and the maximum amount of work is secured.

Showing the well-known ROME High Lift feature



The ROME is the original grader with the patented High Lift feature, enabling the operator to stand on his platform, turn the handwheels and set the moldboard at any angle he chooses, or easily adjust it from a ditching or grading position to a bank-cutting position. The blade is adjusted to the high lift position in a jiffy, without the use of wrenches or other tools.

ROME MOTOR GRADER, power-controlled; tandem drive, eight tires; scarifier attached; powered with International I-30 tractor.



ROME Motor Graders are furnished in a number of sizes, either power or manual-controlled, and either single drive or tandem drive. They are powered with the well-known and universally used International, Case and Oliver tractors. Bulletins: No. 73, "ROME MOTOR GRADERS," and No. 78, "ROME High Lift Leaning Wheel Graders." Write also for Bulletin on "ROME AUTO-MOWER."

"The Best Bargain is Quality"

ROME GRADER & MACHINERY CORP.
ROME, NEW YORK

Report on Cotton Fabric for Roads

(*Continued from page 2*)

It was thought that a layer of fabric, placed on top of the base and impregnated with bituminous material might act as a waterproof membrane and prevent moisture from reaching the base.

A number of different cotton fabrics have been tried out on experimental roads built in the past ten years. Fabrics of different weights and weaves have been experimented with but most of the experiments have been with cloth of relatively open weave. Data available show the weights to have ranged from about 3 ounces per square yard of fabric to about 6 ounces. The number of threads per inch ranged from 3½ by 7 to 20 by 20.

In general, fabrics have been used in the type of bituminous construction commonly called "surface treatment" although in some localities the same general type is known by other names. While the details of construction may vary, surface treatments are applied essentially in the following manner:

Types of Construction with Fabric

The existing road that is to serve as a base for the new construction and which may be of soil, sand-clay, gravel, crushed stone, slag or other similar material, is first brought to the proper condition by such machining, blading, patching and rolling as may be necessary to produce a smooth uniform surface. This base is then given an application of a liquid bituminous material, usually called the prime coat, which may be asphalt or tar.

When the prime coat has penetrated into the base and has dried and hardened sufficiently to permit construction equipment to travel over it without damage, hot or cold-application asphalt or tar is spread and is immediately covered with a layer of mineral aggregate such as gravel, crushed stone or slag. After the surface has been thoroughly rolled, the road is opened to traffic.

When cotton fabric is used in connection with surface treatment it is placed after the base has been primed and before the second application of tar or asphalt. Sometimes it is placed immediately after the prime coat so that the fabric will be impregnated with priming material and, as the latter dries and hardens, it will hold the fabric firmly in place. In other cases it is placed after the prime coat has dried thoroughly, in which case the fabric must be tacked down so that it will not be disturbed when the hot material is spread over it. Sometimes the fabric is laid in a single strip along each edge and sometimes it is laid the full width of the bituminous treatment.

Fabric may be used either in original surface treatment as described or in what is termed "retreatment," which is simply the placing of a relatively thin new surface on the old bituminous surface. The method of construction and use of fabric in retreatment is almost identical with that already given except that the bituminous material used is nearly always a cold application material and the aggregate used as cover is smaller in size than that used in the original treatment.

Spreading the Cotton

The fabric, which comes in rolls, is rolled out over the surface in a longitudinal direction with adjoining strips overlapping 2 or 3 inches. Ordinarily 3 or more strips of fabric are used when covering the full road width, the number of strips used depending upon the width of the surface and the width of the fabric available.

To prevent displacement of the fabric by the wheels of the distributor used in spreading the bituminous material upon it, a small amount of aggregate may be spread first or the wheels of the distributor may be oiled lightly with a very thin oil such as a mixture of kerosene and light lubricating oil.

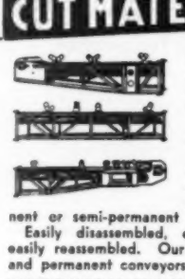
Experimental Projects

The experimental roads in which fabric was used prior to 1936 were short in length and were located in scattered areas of several states. Most of the experimental construction prior to that year was in South Carolina where cotton fabric was first used in 1926.

These early experiments showed some promise but they did not offer a satisfactory basis for definite conclusions as to the value of cotton fabric or the type of fabric most suitable. The variable conditions existing on the short, widely scattered projects made it difficult to establish definitely whether the service behavior of the treatments was due to the fabric or to other factors that have an important bearing on the behavior of bituminous pavements. Lack of information regarding the cost of construction and maintenance of the experimental roads made it impossible to determine whether the benefits received were commensurate with the cost. Obviously, to obtain such information, it is necessary to study roads of lengths sufficient to give reliable cost data and so constructed that the only variable is the presence or absence of the cotton fabric.

(*Continued on next page*)

NEW WAYS TO CUT MATERIALS HANDLING COSTS



The flexibility and adaptability of the Porta "Model 347" sectional conveyor offers wide opportunities for cutting costs and increasing profit in the handling of concrete and aggregates.

Made up of independent sections.

Can be used on wheel truck, caster mounting or on supports as permanent or semi-permanent conveyor.

Easily disassembled, easily transported, easily reassembled. Our catalog describes our complete line of portable, sectional, and permanent conveyors designed to suit every contractor's requirement.

PORTABLE MACHINERY CO., York, Pa., Clifton, N. J., Chicago, Ill.

New One-Tonner BRINGS FORD V·8 ECONOMY TO ONE-TON RANGE

Many operators of hauling and delivery units have asked Ford to build a unit that would handle one-ton loads with the same proved performance and economy that Ford V-8 units of larger and smaller capacities bring to their respective fields. Result: The new Ford V-8 One-Tonner.

The One-Tonner has a 122-inch wheelbase. It has been designed to take advantage of the unusually economical 60-hp. V-8 engine, although the 85-hp. V-8 is also available where higher speed and faster acceleration are desired.

Though low in price, the One-Tonner has the time-proved features that make the larger Ford V-8 Trucks so reliable. Frame, springs and axles are designed for high reserve strength, without penalizing economy with excess weight.

Visit the nearest Ford dealer and arrange for an "on-the-job" test with your own loads and your own driver. While there, you will also see the new 1938 Ford V-8 134-inch and 157-inch wheelbase Trucks and the new 112-inch Commercial Cars — the finest, best looking units in all Ford history.

New Features of 1938 Ford V-8 Trucks

New styling • More comfortable cabs, more head room, new interior trim, softer seats • Quicker stopping brakes • New 134-inch wheelbase, improved load distribution • For 134 and 157 inch trucks, new standard frame width • Larger spindles • Easier steering, roller type with 18-inch wheel • TIME-PROVED FORD TRUCK FEATURES: V-8 engines, 85 and 60 hp. • Full-floating rear axle with tapered roller bearings • Straddle-mounted pinion, ring-gear thrust plate • Centri-Force Clutch, low pedal pressure, high torque capacity • Needle roller bearing universal joints on 134 and 157 inch trucks • Full torque-tube and radius-rod drive, free-shackled springs • Ford Engine and Parts Exchange Plan.

1938 FORD V·8 TRUCKS AND COMMERCIAL CARS

FORD'S SEVENTH YEAR OF V·8 SUCCESS

Bituminous Roads Built with Cotton

(Continued from preceding page)

The 1936-1937 Program

An opportunity to obtain such data was presented when the Department of Agriculture was authorized by Congress to purchase large quantities of cotton for the purpose of promoting and encouraging its use in new fields. It was believed that by using some of this cotton in highway construction under a variety of conditions, sufficient data might be accumulated to warrant definite conclusions as to the value of the cotton fabric in road construction and its limitations. Accordingly, in the spring of 1936, the Department offered to furnish without charge to the state highway departments a considerable quantity of suitable cotton fabrics.

The fabric was made available to the states on the condition that it be used in highways constructed in an approved manner and that reasonable care be taken in obtaining data regarding the service behavior and cost of maintenance of the roads in which it was used so that future evaluations might be made of the benefits derived.

Twenty-four states took advantage of this offer and, as a result, the Department distributed enough fabric to surface nearly 6,000,000 square yards, or more than 500 miles of 20-foot roadway.

The fabric was furnished in widths ranging from 56 to 90 inches, depending on the width of surfacing desired. In order to provide for some determination of the type of fabric best suited for the purpose, each of the various widths was furnished in approximately equal quantities of three grades or types, designated as Types A, B and C. Type A weighed 5.30 ounces per square yard and had a thread count of 12 in each direction. Types B and C weighed 4.25 and 3.20 ounces per square yard, with thread counts of 9 and 7, respectively.

Taking into account the overlapping of adjacent strips of fabric, the average cost per square yard of road surface of the three types of fabric, f.o.b. cars at point of delivery, was: Type A, 7.6 cents; Type B, 6.1 cents; and Type C, 4.6 cents. The total weight of the fabric furnished was approximately 812 tons and its average cost per square yard of road surface was 6.1 cents.

Special Test Roads in South

This fabric has been utilized in the construction of a large number of projects and included in these are four special experimental projects in which the Bureau of Public Roads is cooperating with the state highway departments of Alabama, North Carolina, South Carolina and Tennessee. In these special cooperative projects the roads have been constructed in accordance with the standard practice of the state in which built but much more information is being obtained than is ordinarily deemed necessary in routine construction. Preliminary surveys of the subgrades and bases have been made so that variations would be known and could be eliminated if desired. Sufficient lengths of uniform base were selected, or uniform bases were placed, to provide for the construction of several experimental sections, some with fabric of each type and some without fabric. In practically all cases the minimum length of a section is a half mile. When the base on a portion of a road varied considerably from that of another portion, identical sections have been constructed upon the different portions.

These four cooperative experimental roads have been completed and will be kept under close observation for a period of 5 years or until they no longer have value as experiments. The maintenance cost and the service behavior of each section will be recorded as will other pertinent information which may be of value in determining the merits of the fabrics.

The experimental roads built under the cotton diversion program should eventually provide considerable information from which it will be possible to determine whether cotton fabric has real value, either in extending the life of a bituminous pavement by delaying or preventing failures or in reducing the maintenance cost. It should also be possible to determine which type of fabric is best or which is required for given base conditions and whether the cost of the fabric is commensurate with the benefits derived, either in reducing base construction costs or in increasing the value of the bituminous mat.

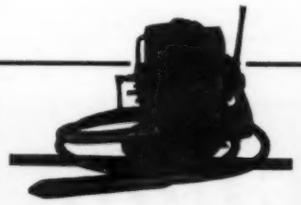
The roads built prior to 1936 have been influenced by too many conditions to permit a determination of the value of the cotton and the many miles constructed in 1936 and 1937, under the cotton diversion program, have not been in service sufficiently long to warrant any conclusions. The use of cotton fabric in bituminous road construction must still be considered in the experimental stage.

Bulletin on Crusher Covers Two New Models

A new bulletin, No. 264-D, on Telsmith-Wheeling jaw crushers has been issued by Smith Engineering Works, Milwaukee, Wis. This Telsmith bulletin describes the full Telsmith-Wheeling line of jaw crushers in addition to the two new sizes, 10 x 21 and 24 x 36. Copies may be secured by any reader of CONTRACTORS AND ENGINEERS MONTHLY from Smith Engineering Works, 4014 N. Holton St., Milwaukee.

Holcomb Has Memphis P & H Sales Territory

Ralph B. Holcomb has been appointed District Sales Manager of the Memphis territory by the Harnischfeger Corp., of Milwaukee, Wis. Mr. Holcomb has for some time been connected with the P & H sales force as Sales Engineer. He started in the Kansas City territory, later being transferred to New York and then to Philadelphia.



Concrete VIBRATORS
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ELKHART INDIANA

Increased batch capacity and almost double the possible number of batches per hour are reasons responsible for the high production records established by the NEW Koehring Dual Drum 34-E Paver. Proven performance on many jobs is the record of this newest Paver now presented to paving contractors, as the latest contribution by Koehring to highway paving progress. See this most modern Paver at the Road Show, or write for bulletin giving complete information.

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The Allis-Chalmers Speed Patrol Grader with its Snow Plow Turns from the Main Road to Open Up a Farmer's Drive

Patrol Graders Shown In Action in Snow

Traveling some 5,000 miles in two months last winter in heavy snow a pair of Allis-Chalmers Speed Patrols were demonstrated by the Drott Tractor Co., of Milwaukee, in 45 of the 71 counties of Wisconsin. One of the machines was a K-O Model burning diesel fuel oil and the other a Model 54 gasoline powered machine and both were equipped with Wausau plow attachments. The trip was well-planned; city, county and township officials were notified well in advance of the day the demonstration would take place in their community. One day one of the tandem-drive models covered 125 miles in order to keep on schedule. The operator was fed sandwiches while he drove so he would not have to stop the machine.

The main idea of the demonstration was to show road officials that a heavy-duty machine like the tandem-drive Speed Patrol, equipped with a Wausau plow and wing attachment could, with equal effectiveness and economy, move heavy snow drifts, maintain roads, perform grading or mix black top in summer. The Wausau plow is hydraulically operated and is controlled by the operator from the cab for greater efficiency in removing heavy, frozen drifts. Chains were used on the tandem-drive wheels for providing better traction and for making the engine power more effective.

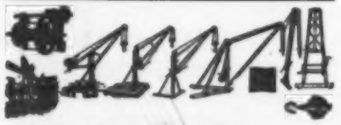
Reinforcing Rods in Brick Pavement

Reinforcing brick masonry by embedding steel rods in the mortar joints has for some years been a practice in building construction that has received increased recognition and utilization. The slab strength developed in reinforced structural brick masonry pointed to the possibility of this type for pavement slabs and in 1931 led to an installation in the driveway of a brick plant in Illinois. Brick were placed in a "basket weave" manner with three brick constituting a unit. Reinforcement of ⅜-inch round deformed bars was placed at 8¾-inch centers both ways, 1 inch from the bottom, and all joints filled with 1:2 cement mortar. Two weeks after the slab was completed, an excavation was made under one side creating a clear span of 5 feet. It is estimated that during the past six years 25,000,000 paving brick have been trucked over the pavement which shows no signs of distress over the span.

Based on the success of this experiment an additional test section 38 feet wide by 75 feet long was installed on West Grand Ave., in Springfield, Ill., in September, 1937. Instead of using standard paving brick in basket-weave pattern, large vitrified units 3½ x 8 x 8 inches were manufactured. They were laid by hand in checkerboard pattern, properly spaced, and reinforcing rods placed in two directions in the cement-grouted joints. Transverse expansion joints will be necessary in a long project although volume change due to thermal expansion and moisture will be less than for concrete.

The Ohio Highway Department and the National Paving Brick Association are planning another test installation in Ohio. A base course of the stabilized type will be used under some of the sections. This type of pavement will not require curbs or headers on the sides, and it is estimated that it will be less expensive than the usual design. However, according to the National Paving Brick Association, it should now be considered as having only an experimental status.

Twelve Miles of Concrete Road in 60 Days. See February Issue.



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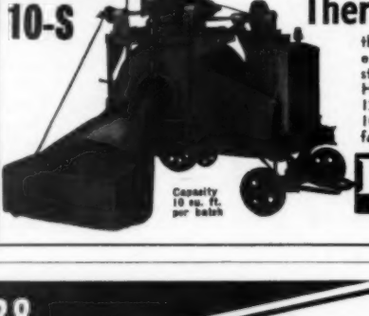

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White TRUCKS

New High Earth Dam For Denver Completed

Ralston Dam Project Required Rock Quarry, Processing Earth and Concrete Outlet Tunnel

By ORMAN M. STRANGE, Field Engineer, Denver Water Board

(*Photo on page 56*)

✦ THE CITY of Denver, Colo., acting through its Board of Water Commissioners, has constructed an operating and storage reservoir on Ralston Creek about 17 miles northwest of Denver to impound water brought from the western slope through the Moffat Water Tunnel for additional domestic supply for the City. The dam for this reservoir is a high earth structure, containing approximately 2,400,000 cubic yards of earth and rock. The dam, with its thin impervious core, rises approximately 190 feet from its foundations and is about 1,150 feet long at its crest, thus ranking as one of the ten highest dams of this type.

The dam and its appurtenant structures were planned so that excavation for the spillway furnished ample material for the pervious sections of the dam. This spillway and the borrow pits for impervious materials were located on the mesa immediately north of the dam, close enough to the dam site that the average haul did not exceed 3,000 feet. The material for the impervious section contained only a small amount of rock, and it was therefore possible to haul direct from the borrow pit to the embankment. The small amount of rock that did occur was removed by hand methods from the fill before rolling. The material from the spillway excavation contained from 3 to 5 per cent of oversize cobbles and boulders, which made it necessary for the contractor to build a screening plant for the preliminary removal of the oversize rock. This plant was located on the edge of the mesa which forms the north abutment for the dam.

Stripping

Before work on the dam itself could be started it was necessary to strip undesirable materials from the dam site and from the borrow pits. The materials encountered varied from heavy clay and partially disintegrated shale to gravel and boulders, and from a depth of 1 foot to 40 feet. Obviously it was necessary for the contractor to use several different types of equipment. For superficial stripping of the dam site LeTourneau Carryalls were used. This equipment was also used on the north abutment of the dam where the material removed was clay containing little or no rock.

The stripping on the north abutment required for the pervious sections of the dam was a sandy clay material, having but little surface vegetation, and the amount to be removed was very light, from 1½ to 3 feet in depth. There was considerable speculation as to the best method for removing this material. It was finally decided to remove it on the 26 per cent slope by means of tractor-drawn LeTourneau Carryalls. This method proved entirely satisfactory, and no difficulty was experienced with the equipment, since it was possible to fill a Carryall completely on every trip, in spite of the steep grade and the heavy load. For the deep stripping on the dam site and for the excavation for the impervious core of the dam, the contractor used 2¼-cubic yard Lima power shovels which loaded the excavated material into 5-cubic yard Hug trucks for disposal.

It was also necessary to remove from 1 to 3 feet of undesirable material from the borrow pits prior to excavation. For this purpose the contractor used the LeTourneau Carryalls and a Caterpillar 48-inch elevating grader with Hug trucks. Approximately 550,000 cubic yards of undesirable material was stripped or excavated from the dam site and from the borrow pits. It was possible to waste all materials within 1,500 feet from the point of excavation. Materials stripped from the dam site were wasted in the valley below the dam and materials from the borrow pits were so placed as to provide additional freeboard for the auxiliary spillway.

Two Types of Dirt Movers Used at Ralston Dam—a Euclid Trac-Truk and a LeTourneau Carryall Scraper

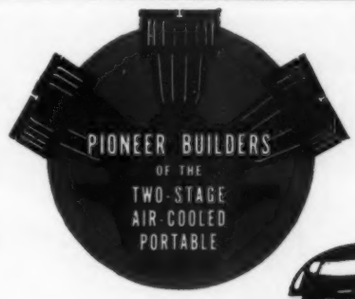
Embankment

The embankment of the dam was started in September, 1936. Part of the material used in the early stages of the embankment was obtained from the deep stripping of the dam site. After this supply of material was exhausted, the borrow pits located on the mesa north of the dam were opened up. Material for the core portion of the dam was hauled direct from the borrow pit to the embankment in trucks. Approximately 5¼ cubic yards, borrow pit measurement, was hauled per load.

Early last spring Euclid Trac-Truks replaced motor trucks for hauling the selected core material for the fill. This was made necessary by the difficulties experienced with the material, which contained approximately 25 per cent clay and about 15 per cent water, sticking to the bodies of the motor trucks, involving loss of time either in transportation or for hand cleaning of the truck bodies.

Materials for the pervious sections of the dam were excavated and hauled to the processing plant mentioned before. Here all cobbles and boulders over 8

(*Continued on page 55*)



Two-Stage Air-Cooled PORTABLE COMPRESSORS

This Model 85A two-wheel trailer-mounted Portable Compressor is one of the new machines. It operates one JA-55 Jackhamer or two of the largest paving breakers.

Contractors everywhere are adopting Jackbits. They reduce drilling costs and speed up the work.

To the modern line of Two-Stage Air-Cooled Portable Compressors we have added several new models. These will be on display for the first time at our booth, Number E-36 at the Cleveland Road Show on January 17th to 21st inclusive.

We invite every roadbuilder and contractor to call at our booth and look them over. Other products which we will have on display are rock drills, Jackbits, paving breakers, hoists and pneumatic tools, each of which are made in a complete range of sizes and types.

If you cannot attend the show, ask our nearest I-R branch or dealer for complete information and catalogs 3264 and 1604-F.

Ingersoll-Rand

11 BROADWAY, NEW YORK, N.Y.

Long Overpass Built at Memphis

(*Continued from page 33*)

the reducing section.

The section in which this viaduct is being built is a bottom, over which Cypress Creek has wandered throughout historic times. The old creek bed was hit in several different locations across the bottom and in several cases the piles had to be driven 4 to 5 feet deeper to get the required designed bearing of 25, 30 or 35 tons. The bearings at the end of driving ran from 35 tons to refusal, requiring cut-off.

The pile-driving contractor had the piles spotted near the driving locations and snaked them in with the hoist winch on the steam pile driver. A No. 1 Raymond steam pile driver was used in 56-foot leads and a Raymond hoisting engine on the 13-foot circle. The leads were so mounted as to have a 7-foot cantilever over the front of the circle.

The columns, 2 feet square, carry reinforcing bars ⅝-inch round extending into the beam of the deck and around these four bars is ⅞ to 1¼-inch round hoop reinforcing on 12-inch centers. The cap is continuous over the two columns and varies from 4 feet 3 inches to 6 feet 6 inches in height, depending on the span length supported. The columns for the longer spans are larger in cross-section and have larger footings with as many as nine and twelve piles per footing.

The roadway slab for the 28-foot 6-inch spans is 8 inches thick and the girders 1 foot 10 inches and 1 foot 8 inches. There is also a 5-foot sidewalk on each side of the roadway and a precast spindle and monocast handrail on both sides. The roadway slab reinforcing consists of truss bars of ⅝-inch round steel on 2-foot centers alternating with inverted bars, making a 1-foot center for the truss bars. Between the truss bars are straight bars of the same diameter which brings the spacing of the reinforcing with ⅝-inch bars down to 6 inches. The transverse bars in the slab are on 1-foot centers.

The girders are reinforced with 1¼-inch round straight and truss bars as follows: two truss bars, and two straight bars at top and bottom, with ½-inch stirrups along the girder, fourteen at 7-inch spacing, twelve at 11 inches and then fourteen at 7-inch spacing.

Concrete Forms

The forms for the bent caps were made up of ¾ x 7-inch tongue and groove lumber with laminated wales of 2 x 4's and 2 x 6's and studs of 4 x 6's. Where the studs were directly over the columns the contractor used wire ties through the forms; otherwise he used rectangular clamps over the top and bottom protruding ends of the studs. The Superintendent had designed these clamps himself and has a patent pending.

The column forms were built in panels 4 to 24 feet high, depending on the column height, of 6 x ¾-inch tongue and groove lumber, all in horizontal strips without any lining. The studs were nailed directly to the form lumber with three on the outer ends of the forms and one in the center and 2 x 4 wales outside the studs. The wales each carried the form clamps, one on top of each wale set up tight with wedge pins.

On the deck forms the contractor used I-beams instead of falsework. This did not do away entirely with the falsework as it was necessary to drive light piles to support the cap forms and concrete and to support the ends of the I-beams under the slabs.

Central Batching

A central batching plant was set up

C. & E. M. Photo

Driving Concrete Foundation Piles

at about the mid-point of the structure and off 150 feet to one side of the center line. This made it possible for the aggregates to be stockpiled clear of the structure and to use one of the spare switching lines of the Union Belt Line as a spur track. The sand and gravel for the concrete was unloaded from the gondola cars by one of the contractor's two Lorain 40's using a ⅝-yard Owen clamshell. The aggregate was loaded into a pair of Blaw-Knox batcher bins for weighing the individual batches.

Two 3-batch trucks handled the batches from the central plant to the 3-bag Smith mixer wherever it was located for pouring over the job.

Pouring Concrete

For pouring concrete in the footings, which were excavated with a Lorain 40 and a ¼-yard clamshell and frequently had to be pumped out to prevent flooding of the forms and also to permit the forms to be set accurately, the contractor set the Smith mixer in the center of a group of four or six footings ready to be poured and swung the concrete with the Lorain, using a bottom-dump bucket for the concrete. A battery of 3 and

(*Continued on next page*)

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NOW ON DISPLAY—ASK FOR A DEMONSTRATION
SEE YOUR CHEVROLET DEALER

Well-Planned Plant On Tenn. Overpass

(*Continued from preceding page*)

4-inch Jaeger Sure-Prime centrifugals with Hercules power was used for pumping out the footings.

For pouring the columns and the deck and girders, the mixer was set close by at ground level and for the columns with one of the two Lorains equipped with a straight or a goose-neck boom alongside. In the case of the deck the Lorain was carried on the deck on pairs of 12 x 12's under each crawler, blocked so as to support the weight of the machine on the bents instead of on the falsework.

The two batch trucks shuttled from the central batching plant and dumped into the skip of the Smith mixer. Two men handled the three bags of cement per batch and also helped dump and clean the trucks. When the batch was raised to the deck for pouring, four puddlers spread the batch and one of them handled the Mall vibrator to insure the placing of the concrete in close contact with the steel. There were two of these machines used on the job alternately for vibrating and for rubbing concrete.

Six finishers on the deck first used a 28-foot wood truss longitudinal screed or float and then an 8-inch canvas belt followed by broom marking of the surface to prevent skidding. Tennessee takes great pride in the smooth-riding qualities on its bridge floors. This has been brought about solely by the manipulation of this longitudinal truss screed spanning the entire section being poured. One end of this screed rests on the adjacent finished slab. At the other end of the span being poured, the vertical studs of the curtain wall are capped with a 2 x 4 laid flat and conforming exactly to the desired cross-section or crown of the roadway. The other end of this screed slides on the 2 x 4 cap with a longitudinal cross-cut saw motion as well as a constant side movement across the bridge span.

Personnel

This grade separation project, WPGM 426-B, was awarded to Hickman & Long of Memphis, Tenn., for $314,495.13 and work was started March 14, 1937, with an allowance of 300 working days for its completion. For the general contractor, Sam Shubert was Superintendent, and E. W. Phelan was Superintendent for the Raymond Concrete Pile Co. of New York, subcontractor on pile driving. For the Tennessee Department of Highways and Public Works, C. R. Moser was Resident Engineer, S. J. Ingram, Concrete Inspector, L. B. Rawdon, Design Inspector, and M. J. Ryan, Senior Rodman.

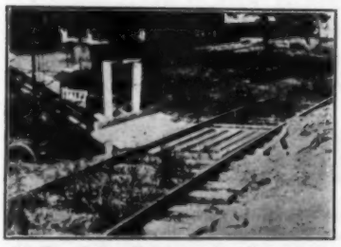
Troughing Conveyors For Unloading Stone

Practically every highway department has at one time or another used portable conveyors for unloading sand and gravel from hopper bottom cars into trucks. The North Carolina State Highway Department has developed a standard practice for this type of work which we are describing and illustrating for the benefit of our readers. North Carolina has a large program of black top work on secondary roads and has consequently developed this method of handling the aggregate to minimize delays at railroad sidings.

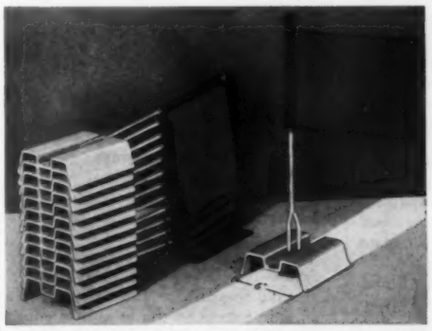
Haiss standard portable troughing conveyors with a 24-inch belt 25 feet long and with rubber cleats, standard heavy wheel swivels and pneumatic-tired wheels, are used. These are powered with 4-cylinder LeRoi radiator-cooled engines and when it is necessary to move them, they are towed from one job to another at speeds of 25 miles per hour.

Where possible a location is picked where the siding is higher than the surrounding ground. One tie is taken out from the track and a pit excavated to the width between the two adjacent ties. This pit is widened at the bottom if necessary so that the foot of the conveyor frame can be inserted. At the discharge side the pit is enlarged to accommodate the conveyor carriage and wheels. The pit is lined with plank and a plank grill nailed over it to prevent the sand and gravel jamming. A small opening is left in the plank lining at the foot of the conveyor and another part way up. The work of excavating this pit and lining it takes four men about one-half day. The work is done quickly and inexpensively.

With this pit and conveyor a 2 to 3-yard light truck is loaded in 30 seconds, making it possible to move from 300 to 400 tons of stone or sand per hour. A most interesting feature of this plan of operation is that the conveyor is a standard unit without a foot hopper or gates. The lined pit and the small openings over the conveyor belt make a hopper structure and gate unnecessary.



Set-Up of the Conveyor for Temporary Use at a Siding



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With 3-speed transmission, there's a change of pace in digging, too, whether it's soft soil or the toughest clay. It has P&H HIGH-LEVERAGE DRIVE for snappier action and less clutch wear. The 255 has more horsepower than any other machine of its size!

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Counties Financed State Roads in Ill.

(Continued from page 2)

of a direct road tax by counties for the construction and maintenance of county highways. The Supreme Court of Illinois nullified this act for a period of two years before it was enacted in a satisfactory form. In 1923 the State passed a $100,000,000 bond issue for roads and added another 2,500 miles to the state highway system. In 1927 the state motor fuel tax law was passed, allowing a tax of 2 cents per gallon for highway funds. This was declared unconstitutional. In 1929 another similar law was passed, making the motor fuel tax 3 cents per gallon and allotting 2 cents to the state and 1 cent to the counties. This was amended so that the state, county and city each receive 1 cent of the tax at the present time.

In 1931 a law was passed permitting the State to repay to the counties the money they had advanced for the construction of state-aid roads under Section 15D as the State's share of the cost of construction.

Finances in St. Clair County

St. Clair County in western Illinois has an area of 625 square miles. In 1917 a bond issue for $1,500,000 was passed for roads. The County now receives money for highway construction and maintenance from the following sources.

1. A county highway tax on all property real and personal amounting to 10 cents per $100 assessed valuation. The maximum rate permitted is 12½ cents. This brings in about $125,000 annually.
2. Refunds of about $90,000 a year from the State. St. Clair County has spent about $3,000,000 on the construction of parts of the state bond issue system, on which the County has secured refunds under provisions of the original State Bond Issue Acts. As this debt is about cleaned up, this source of highway money will not continue very much longer.
3. About $40,000 received annually from the State as reimbursement to the County for its advances under Section 15D.
4. From the state motor fuel tax of 1 cent allotted to the counties, St. Clair County receives about $190,000 annually, after the principal and interest on the $50,000,000 relief bonds has been deducted. This was a handy device by which the people of Illinois voted to take the money for the amortization of the relief bonds from the gas tax originally set up for highway work rather than pay additional taxes for the needed relief money.

Township Organization

County and township organization in Illinois represents the transition between the town government system of the East and the county system of the West. The County Board of Supervisors controls county expenditures and is elected by the several towns, the number being apportioned roughly on the basis of population.

St. Clair County has a population of approximately 160,000 and is governed by a Board composed of forty-five supervisors. The individual townships construct and maintain all roads and bridges except those under the jurisdiction of the State and County, being roughly 60 per cent of the total mileage. Some aid is given to the townships by the County for the construction of the more important bridges. Each township's road affairs are administered by a Highway Commissioner elected by the town and who is free of all restraint except for all contracts entered into having a value of over $200. Actually there is a very close cooperation between the Highway Commisioners and the County Superintendent of Highways who acts as their advisor and who is required to prepare plans and specifications for all permanent improvements executed by the townships.

The funds available to the Highway Commissioner have not permitted a state-wide improvement of farm-to-market roads, except in the wealthier counties through the central and northern part of the State where deposits of gravel are at hand. In many sections of the State and particularly in the less wealthy sections, satisfactory materials are not readily available.

Each year the township Highway Commissioners certify to the County Board of Supervisors the amount of money needed for road maintenance. The County Board approves or amends the request and then the money is collected by the townships by direct taxes within the townships. They can levy up to 25 cents per $100 assessed valuation, or if the Town Auditors consent they may levy as high as 33 cents. In St. Clair County the assessment ratio is about 35 per cent, while the same fiction of 100 per cent valuation for assessments exists as elsewhere.

Work of St. Clair County

The mileage of roads in St. Clair County which is maintained by the County consists of 70 miles of unimproved oiled earth roads; 90 miles of permanently graded oiled earth roads; 40 miles of oiled traffic-bound crushed stone roads; 10 miles of oiled cinder roads; and 5 miles of retread roads. The townships have about 400 miles of unimproved roads which are not oiled; about 150 miles of oiled earth roads;

(Continued on next page)

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Highway Building In Illinois County

(Continued from preceding page)

85 miles of stone roads, a portion of which is oiled; and 90 miles of cinder roads.

There are 260 miles of concrete highways in St. Clair County on the state highway system which was built by the State and County and which is maintained by the State Highway Department. Under the state law as soon as concrete or other heavy-duty pavement is completed by a county it becomes the duty of the State Highway Department to maintain it.

During 1937 the County added 15 miles of traffic-bound stone road and the townships are adding 25 miles as WPA projects.

Due to the urban character of St. Clair County, as it forms the east gateway to the St. Louis Metropolitan District, a large share of new construction is along routes through cities and very frequently the projects are joint contracts with the cities. Vast sums have been expended by the Federal, State and County governments in the construction of grade separations which are required by the converging of nearly a score of main-line railroads entering St. Louis from the northeast, east and southeast. Approximately $4,000,000 has been expended for that purpose, single projects running to as much as $800,000.

Expenditures

The county highway organization constructs, operates and maintains the state-aid system up to the time that the concrete or other pavement mentioned above is constructed. St. Clair County maintains an earth road system with road oil, using about 800,000 gallons annually. This E2 and E3 material is applied by contract. The E2 material has a greater penetration and is used on the older roads that have become compacted, and the E3 is a heavier oil used on new or sandy soils.

County money is expended for: 1. maintenance; 2. right-of-way for state and Federal-Aid roads up to $100,000 annually; 3. new construction in cities and rural districts.

Equipment Used

St. Clair County has three motor patrols, each with 12-foot blades, made by Adams, Allis-Chalmers and Austin-Western, three Adams light patrol graders, one 10-foot and one 12-foot Adams graders, as well as a La Crosse rotary spreader for stone chips. It owns two Caterpillar Sixty gas tractors, two Caterpillar Twenty gas tractors and three Caterpillar Fifteen gas tractors. One Hug 4-ton, two Chevrolet and three Ford 2-ton trucks are used for hauling stone, materials and labor.

For the past year, the county has been operating a quarry as a WPA project, producing from 50 to 60 tons of crushed stone per hour. The quarry is equipped with county-owned machines, including a No. 7½ Allis-Chalmers gyratory crusher, an Austin-Western 18 x 30 roll crusher, Austin-Western conveyors and screens, all of this equipment being electrically driven. Included in the quarry plant are two Gardner-Denver 105 portable compressors, a Gardner-Denver wagon drill, two Dempster-Dumpsters of 1½ yards capacity, each doing major service as quarry wagons hauling 2 tons of stone per load, and three 3-ton Mack trucks.

Personnel

In the County Highway Department offices there is an average of eight employees with ten engineer employees in the field. The maintenance crews consist of about fifty employees. The Department is housed in its own building, built in 1931 at a cost of $100,000.

We are greatly indebted to B. C. McCurdy, County Highway Superintendent of St. Clair County, Belleville, Ill., for the interview which made this instructive article possible.

Can You Recognize Frozen Concrete

It is well to know how to recognize frozen concrete so as to be able to prevent any possible failure when a sudden cold spell or a breakdown in the heating equipment has permitted the temperature to drop materially during setting. The best test is to remove a small section of the form and apply steam, hot water or a flame from a torch-type heater directly to the concrete. This application of heat will cause the concrete to soften immediately, if it has frozen, because of the melting of the ice. If the concrete has not frozen, the heat will not affect it.

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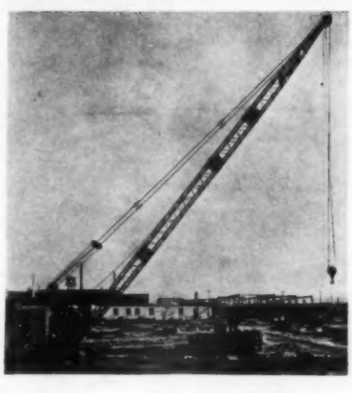

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These units are so made that each function operates independently and simultaneously.

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16226 Waterloo Rd., Cleveland, Ohio

Export Department

30 Church Street, New York, U.S.A.

CRAWLER, TRUCK AND WAGON
SHOVELS
DRAGLINES
CRANES - HOES

BROWNING PRODUCTS

DIESEL
GASOLINE
STEAM
ELECTRIC

Skip-Pipe with Locking Joint Assembled

Flexible Locking Joint For C. I. Drainage Pipe

Skip-Pipe, a cast-iron dual-purpose drainage pipe, is now available with a locking joint which is positive in action yet flexible. A raised pad is cast in the lower third of the bell forward and a similar raised pad is cast on the spigot rearward. The spigot pad cradles or sockets behind and below the forward bell pad. The joint is clamped together with a malleable iron clip driven up on an inclined cast iron ear on either side. Thus, a positive lock is secured by the connection, yet the deflection per joint is considerable owing to the use of malleable iron clips, according to the manufacturer, Dimick-Mosher Products Co., 120 Boylston St., Boston, Mass.

The earlier laboratory tests of Skip-Pipe have been elaborated by the use of a large-sized test tank and the use of full-sized 6-inch commercial pipe. The manufacturer reports comparative tests of cast iron Skip-Pipe, perforated corrugated pipe, and vitrified clay pipe. In the reported tests a 3-inch head was maintained and the Skip-Pipe began flowing in 28 seconds, the perforated pipe in 62 seconds and the clay pipe in 80 seconds. Skip-Pipe took off 50 per cent of the water, the perforated pipe 35 per cent and the clay pipe, 15 per cent, it is reported.

Skip-Pipe in iron with a lock joint is being manufactured at Boston, Mass., in 6, 8, 10 and 12-inch sizes. When tested by the Massachusetts Department of Public Works, one 6-inch specimen 3 feet long took a load of 40,000 pounds before failure. The second specimen took 39,300 pounds, and 8, 10 and 12-inch sizes took slightly lower loads. but are reported to have been fifteen times as strong as specifications required. Dimick-Mosher is furnishing fittings such as crosses, right-hand and left-hand tees, and bends all equipped with the interlocking joints.

New Heavy-Duty Jacks

An improved model heavy-duty automatic lowering jack has been announced by the Buda Co., Harvey, Ill., manufacturer of heavy-duty jacks for over 50 years. The model, known as No. 2215, has a capacity of 15 tons, is 22 inches high and has a rise of 13¾ inches.

One of the features of this jack is that the load may be raised or lowered on three sides of the jack without interference. The automatic lowering device, which is an improved, simplified, adjustable one-piece unit, is located in full vision of the operator, minimizing the possibility of accident during the raising and lowering operations. The jack has a handle conveniently located at the top, so placed that it does not interfere with its operation. The 2215 is light, weighing only 60 pounds.

Complete information on this jack may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Another Mexican Road Nearing Completion

According to a report from the American Consulate at Chihuahua, Mexico, it now appears that the State of Chihuahua's portion of the El Paso-Mexico City highway will be completed within a year as the contract has been let to repair and hard-surface the Ciudad-Juarez-Chihuahua and the Chihuahua City-Parral links in the route. The contract signed by the Compania Mexicana de Caminos, S. A., called for starting the work during November, 1937, and its completion by the end of 1938. In all, about 372 miles are to be built during this period.

The completion of this route will encourage the entry annually of thousands of American tourists into and through this district, a number comparable to that of the American tourists over the Laredo-Mexico City route. The construction of the highway will also lend impetus to work on lateral roads in other districts, particularly in the cotton growing and mining sections of the State.

C.M.C. AGAIN OUT IN Front!

SPACE E-23 MAIN EXHIBITION HALL, CLEVELAND, JAN. 17-21st

YOU'LL SEE AND HEAR ABOUT THEM AT THE ROAD SHOW

CMC New Streamlined, fast moving, 2-wheel Trailers in 5s, 7s and 10s sizes.

CMC Compact, 4-Wheel Side Discharge Models in 5s, 7s, 10s, and 14s sizes. Also built as End Discharger.

CMC New Dual Prime Pumps 1½" to 6". A proved design — improved to bring unbelievable speed in priming and pumping efficiency.

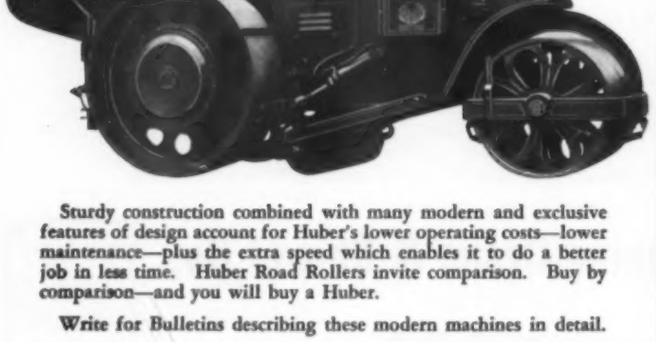
CMC General Utility Double Drum Hoist. 100% hoisting efficiency without extravagance.

CMC Dumpover Pneumatic Tired Carts. Faster material handling at lower cost.

Here are a few of the highlights in the 1938 CMC line of equipment. The big new CMC Catalog pictures and describes the finest and most complete line of equipment offered in our nearly 30 years' experience. Get this catalog. See the wonderful improvements in CMC Mixers, all types and sizes. Plaster Mixers, Dual Prime Pumps, Hoists, Pneumatic Tired Carts, Wheelbarrows and Saw Rigs.

CONSTRUCTION MACHINERY CO.
WATERLOO, IOWA

Built To Do A BETTER JOB!



Sturdy construction combined with many modern and exclusive features of design account for Huber's lower operating costs—lower maintenance—plus the extra speed which enables it to do a better job in less time. Huber Road Rollers invite comparison. Buy by comparison—and you will buy a Huber.

Write for Bulletins describing these modern machines in detail.

THE HUBER MFG. CO., MARION, OHIO

Buy a Huber

6 Sizes — 5 to 12-Ton — Gas or Diesel

Cost Figures for Highway Lighting

(*Continued from page 23*)

the opinion that they can be installed for $4,000 per mile. Annual maintenance expense, including lamp renewals and power, will average $800 per mile per year, depending on local power costs and conditions.

Figures are available, however, on other systems where the state has bought the lighting equipment and contracts with the service company for power. At Tacoma, Washington, the State has lighted 2.9 miles of Pacific highway. Installation cost of all equipment, including labor, was $4,000 a mile. Cost of power for the Washington system is $214 per mile a year. Cost of lamp replacements figures about $433 per mile per year. This installation was made under fairly favorable conditions.

Safer Roads Justify Costs

With more than 40,000,000 drivers operating motor vehicles in the country, the realization of the justification for highway lighting is bound to come.

During 1936, roughly 26,000 persons were killed in rural traffic accidents, as compared with 11,000 deaths within city limits where traffic exposure is greater. Sixty per cent of these fatalities occurred at night, despite the fact that only one-fifth the total traffic flows then. It is obvious that a remedy is sorely needed.

In areas with high-night-accident frequency, modern safety lighting systems will decrease nocturnal traffic mishaps on the average of 36 per cent, as has been proved by actual experience in this county.

Traffic accident records one year before permanent safety lighting was installed on 5 miles of St. Paul highway outside Rochester, N.Y., showed twelve night accidents, one of which was fatal, and eight day accidents. Statistics one year after safety lighting show but four night accidents, none fatal, and six day accidents. This represents a 67 per cent decrease in night accidents, and a 25 per cent decrease in day accidents. Assuming the factors which decreased day accidents 25 per cent also had the same effect on night accidents, this leaves 55 per cent as the decrease due to proper lighting.

The average death insurance claim is $5,000. Over 26,000 fatalities are occurring outside city limits, for the most part on heavy traffic highways where exposure is greatest in rural areas. The majority of these fatalities are occurring at night. Figuring only death claims, we have quite a staggering annual loss due to these rural night fatalities. A mile of safety lighting need save but one life every three years and it will more than pay for itself in accident prevention.

This does not take into consideration the convenience to the public in being able to drive without blinding headlight glare, nor does it consider other benefits to be derived from permanent lighting.

Compact Diesel Engines For Trucks and Shovels

One of the features of the exhibit of the Cummins Engine Co., Columbus, Ind., at the Cleveland Road Show will be its new 500-hp Model VL-1200 diesel, a very compact unit especially designed for industrial or locomotive service. It is a V-type engine with six cylinders in each of the two banks of cylinders. The bore is 7 inches and the stroke 10 inches, and its rated power is developed at 1,000 rpm.

This engine features the Cummins system of low-pressure fuel injection with smooth, rapid acceleration. This new model Cummins diesel is designed particularly for large shovels, draglines, portable construction plants, gravel plant operation, and locomotive service, where space and weight are at a premium.

In addition to this new engine, an LI-600 unit will be exhibited. This is a 200-hp 6-cylinder stationary type of engine for driving compressor plants, generators and construction machinery. It is similar to the VL-1200 except that it has but half the cylinders and is rated at a lower power output.

In the higher-speed types of Cummins engines, a Model HB-6 truck and shovel engine rated at 150-hp at 1,800 rpm will be exhibited. Hundreds of these engines are in use today in shovels and draglines throughout the country and the same units are widely used in dump trucks, freight trucks, industrial locomotives and other mobile units. They are electrically started without the aid of glow plugs or gasoline.

South Bend

BITUMINOUS MATERIAL DISTRIBUTOR

1908—Thirty Years' Experience—1938

MUNICIPAL SUPPLY COMPANY
SOUTH BEND, INDIANA
EXHIBIT IN SPACE D-13, CLEVELAND ROAD SHOW

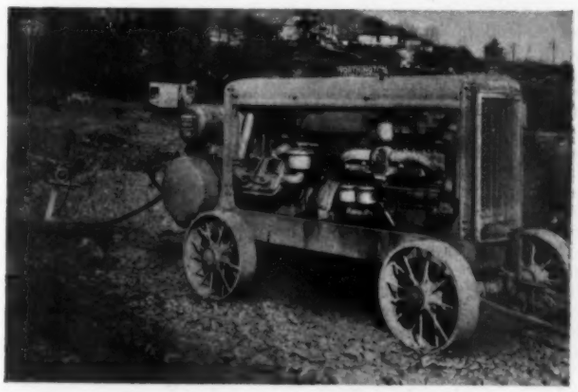
Better Equipment ... Greater Profits

Pavement breaking for gas mains... Worthington 105-cubic-foot Two-wheel Trailer Unit, operating Worthington Breakers

Breaking ground for new water main... Worthington 105-cubic-foot Truck-mounted Unit and Worthington Pavement Breakers

Worthington Portable Compressor with power take-off drive for mounting on any truck. Note ample truck space

See the Worthington Exhibit at the Road Show, Cleveland, January 17 to 21.. Booth D-43

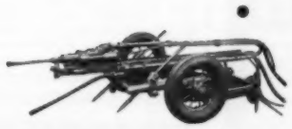


Worthington 315-cubic-foot Two-stage Portable Compressor operating Worthington Rock Master Drills

CONTRACTORS who know their costs leave nothing to chance in assuring a profit on every job. They are using Worthington Equipment and are saving time, labor and overhead expense.

PORTABLE COMPRESSORS
60, 105, 160, 210, 315 cu. ft. ACTUAL CAPACITY
Gasoline Engine or Diesel Engine Drive
All Types of Mountings

SEMI-PORTABLE COMPRESSORS
Gasoline Engine or Electric Motor Drive through Multi-V-Belt



The WORTHINGTON ROCK MASTER

Speeds up drilling...at any angle...on any job. A light mobile rig...readily moved to any job where you can take a hand drill. This modern tool, and Worthington rock drills, breakers, sheeting drivers, trench diggers and tampers are further aids to profitable operation.

No. 24 Rock Hammer — No. 10 Pavement Breaker — No. 19 Clay Digger — No. 8 Backfill Tamper — No. 16 Trench Digger

Ask for a demonstration
... there's a Worthington Dealer near you

WORTHINGTON PUMP AND MACHINERY CORPORATION
General Offices: HARRISON, NEW JERSEY

WORTHINGTON

PCB-1

One of the New Koehring 34-E Dual Drum Pavers Owned by Hardaway Contracting Co. in Operation in Mississippi

Dual Drum Paver Shown With Summer's Record

Outstanding among the equipment exhibited by the Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis., at the Road Show will be the new dual drum 34-E paver, the latest contribution by Koehring to highway paving progress. One of these pavers was used by the Hardaway Contracting Co. in Mississippi during the 1937 construction season with great success. With this machine, contractors have been able to increase yardage from 50 to 90 per cent, over a standard 27-E single drum paver with only a slight increase in auxiliary equipment. The new Koehring has a 25 per cent greater batch capacity and, based on a one-minute mix, produces over 80 batches per hour.

The contributing factors to high production are the non-clogging transfer chute supported outside of the drum, pneumatic operation of the discharge and transfer chutes and the 35-foot boom which facilitates the spreading of the mixed concrete. Automatic control by the batchmeter enables the skip to maintain a high-speed synchronized cycle for maximum batches per hour.

Calcium Chloride Speeds Work on N. C. Road Base

A North Carolina contractor used some Solvay calcium chloride on a base conditioning job early last summer and reported that during dry spells there is nothing like calcium chloride to cut down on the cost of hauling water and to speed up base compaction.

It is well to remember that calcium chloride can be used to advantage in completing base courses so as to get on the surface treatment before the weather becomes too cold.

New 4-Cylinder Diesels

A further addition to its line of high-speed diesel engines has just been announced by the Hercules Motors Corp., Canton, Ohio. The new DOO series, of neat, compact design, includes three models.

The smallest of these, DOOB, has a bore of 3¾ inches and a stroke of 4½ inches, with a total piston displacement of 198.8 cubic inches, and is rated at 62 hp. The DOOC, with a 4-inch bore and 4½-inch stroke and 226.2 cubic-inch displacement, develops 70 hp at 2,600 rpm. The DOOD, the largest of the three models, has a 4¼-inch bore and 4½-inch stroke, a displacement of 255 cubic inches, and develops 56.5 hp at 1,600 rpm. These engines are interchangeable, from an installation standpoint, with the Hercules OO series of gasoline engines so that either gasoline or diesel power may be selected without any mounting complications.

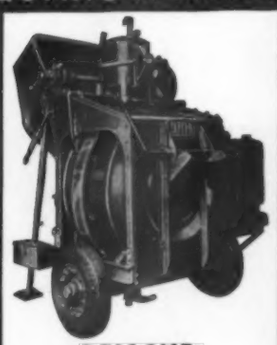
In general design the DOO series follows the principles employed in the larger engines, including the patented auxiliary combustion chamber, designed to insure complete combustion and control of fuel consumption. This pre-combustion chamber, an American development designed and patented by Hercules, is located at the side of the cylinder bore. The throat which connects the cylinder with the chamber is so designed that the piston, on its approach to the top center on the compression stroke, gradually reduces the throat area, thus automatically increasing the velocity of air entering the chamber at the time the fuel is injected, insuring a thorough mixing of fuel and air.

Particular attention has been given to water jackets and water passages. A large-capacity centrifugal water pump supplies ample cooling water which sweeps high-temperature areas. The cooling fan is driven by a V-belt from a pulley mounted on an extension of the crankshaft. Lubrication is forced-feed, supplied by a geared pump, to all main, connecting-rod, piston-pin bearings and to the gear train, as well as to the overhead valve mechanism. Splash or throw-off from the connecting rods lubricates the cylinder walls. An oil filter of excess capacity is furnished with the engine to insure clean oil.

This series is available in power unit form, either fully enclosed or in the open type of assembly, such as is used for pump and generator drives.

Complete information on these DOO diesels may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

BUYING A MIXER?



DEMAND:

- Faster Charging and Discharge Speeds,
- Machined Steel Tracks,
- 2 Wheel Mounting with Timkens and Pneumatics,
- End Discharge Advantages,
- Man-Ten Alloy Steel,

Send for New Catalog, Prices 3½S to 56S Sizes.

THE JAEGER MACHINE CO.
701 Dublin Ave., Columbus, Ohio

JAEGER

Owners Say "Nothing like it for Moving Dirt!"

Here it is—the first revolving scraper which can be converted from full- to semi-automatic control in a moment's time.

The full-automatic feature permits maximum speed where conditions warrant, since the tractor does the work! In other situations, where the semi-automatic control is desired, the operator aided by a rope, always maintains perfect regulation.

New RC "GROUNDHOG"
A FARM TOOLS INC. PRODUCT
REVOLVING TRACTOR SCRAPER

The Groundhog's large capacity and easy operation, plus low investment, economical and trouble-free service, insure more yards moved, at less cost per yard. The "Groundhog" will enable you to make money in earth-moving, even at "low" bids! Write TODAY for illustrated folder containing all the facts.

VULCAN PLOW DIV. WALKING, RIDING AND TRACTOR PLOWS
RODERICK LEAN DIV. HARROWS, CULTIVATORS, WEEDERS, ETC
FARM TOOLS, INC.
MANSFIELD OHIO
PEORIA DRILL DIV. GRAIN DRILLS, SEEDERS AND SOWERS
HAYES PLANTER DIV. TWO AND FOUR WHEEL CORN PLANTERS

Buy BURCH for Better ROAD BUILDING and MAINTENANCE EQUIPMENT

DUMP BODIES and HOISTS

Two types of Hoists to choose from—the "Hydromotor" with balanced power or the conventional but powerful "Burclift." Unusually sturdy steel bodies—all types and designs.

BURCH CHIP SPREADER

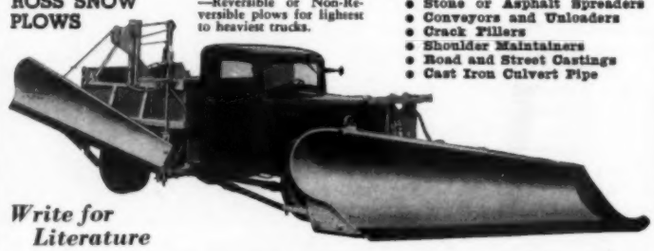
Has independent gasoline motor—not dependent on truck speed. Accurate control of depth and width.

BURCH UNDR-TRUK ROAD MAINTAINER

Seven reversible blades on sturdy frame. Use part or all weight. Raise to travel.

ROSS SNOW PLOWS

"One Way"—"V" type—Reversible or Non-Reversible plows for lightest to heaviest trucks.



ALSO . . .

- Stone or Asphalt Spreaders
- Conveyors and Unloaders
- Crack Fillers
- Shoulder Maintainers
- Road and Street Castings
- Cast Iron Culvert Pipe

Write for Literature

THE BURCH CORPORATION
CRESTLINE, OHIO

HOTEL CHELSEA RIGHT ON THE BOARDWALK

FROM $6 WITH MEALS & BATH
$3 ROOM ONLY & BATH Per Person 2 in a Room

FOR RECREATION OR RELAXATION
Choose the Chelsea

Here you will find everything to further your comfort and enjoyment — outside ocean-view rooms . . . wide verandas for lounging . . . sun deck . . . beautiful dining room at the ocean's edge . . . superb cuisine . . . varied sports and entertainment. You'll like your fellow guests, too, and the delightfully friendly atmosphere of the Chelsea.

SPECIAL WEEKLY RATES

ATLANTIC CITY
JOEL HILLMAN • J. CHRISTIAN MYERS • JULIAN A. HILLMAN

Floating Clamshell For Atchafalaya Levee

(*Continued from page 12*)

motors on the drives while the alternating current supplies power for the various pumps, lights, welding outfits and other services.

The boom is built in two sections with a total length of 240 feet. The first section is 90 feet in length and is built of welded steel composed of two 24-inch I-beams built-up with ½-inch plates and four 6 x 3-inch angles to complete the section. The second section is fastened to the first section by pins and is 150 feet in length. Thus if a 150-foot boom were needed, the first section could be removed and the second section of similar construction used in its place. The complete boom is also strengthened with four large cables as stiffeners. The 15-ton Williams clamshell bucket used on the dredge has a capacity of 6 cubic yards.

The counterbalance carries all the operating machinery as well as three large bins for sand so that the exact weight of the boom and the bucket and material can be compensated. The entire frame section is swung by cables 1⅜-inch diameter and doubled for strength.

Personnel

This work is under the direction of the Second New Orleans District, U.S. Engineer Department, Lieut. Col. William F. Tompkins, District Engineer, and Capt. Chester K. Harding, Area Engineer.

Sources of Revenue For State Hwy. Depts.

The total income for expenditures by state highway departments during 1936 amounted to $1,145,590,000, including a balance of $199,870,000 carried over from 1935. The total funds available were $243,580,000 more than in 1935, $113,399,000 of which is an increase in Federal funds.

The total income from state revenue sources was $669,474,000, an increase of $71,464,000 over the previous year, represented by $42,218,000 in gas taxes and over $30,500,000 in motor fees.

The state income is as follows:

Motor fuel taxes	$434,876,000
Motor vehicle fees	219,088,000
Motor carrier taxes	6,072,000
Appropriations from general funds	3,756,000
Tolls on bridges and ferries	3,850,000
Tax levies	1,377,000
Other state taxes	455,000

The income from other than state revenue sources is as follows:

Federal payments	$328,638,000
Federal advance to trust fund	2,050,000
Other Federal funds	15,593,000
Local government units for work on state highways	12,112,000
Local roads	2,335,000
Bond issues and notes	106,235,000

GAR WOOD for 1938

ENGINEERING SIMPLICITY INSURES the MOST POWER with the LEAST UPKEEP

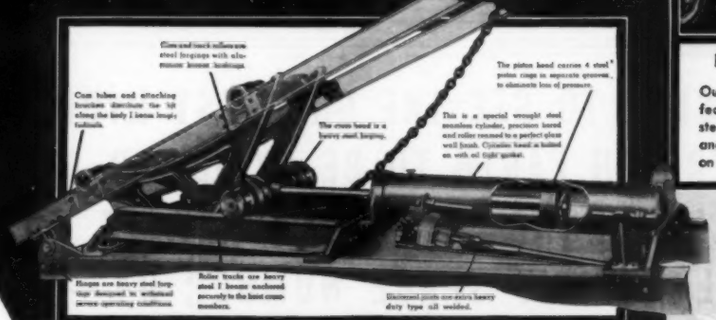
New light-duty units for short and long wheelbase chassis

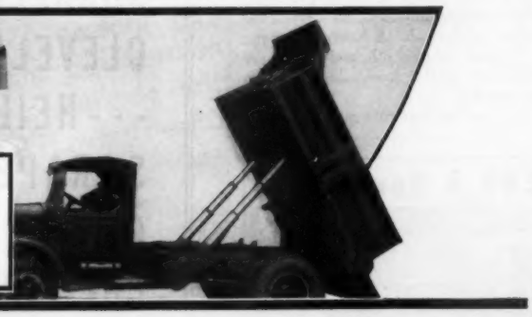
Model D6 hoist is shown above, with only a few of its many new features noted. Lighter, stronger stampings are used extensively. Every detail is improved. . . . Other new models are also available for use with bodies from 7 to 10 feet in length on 1½-2 ton chassis. "C" type bodies, too, have been improved in appearance and construction.

With added strength in construction, the use of forgings instead of castings and finer appearance throughout, all at no extra cost—Gar Wood units now offer the greatest dollar value in dump equipment.

New improvements in "W" and "L" type bodies

Outstanding in appearance, workmanship and service. New features include: heavy-duty offset type hinges; new pressed steel channel plate full width at rear to support corner posts and cover ends of I beams; heavy steel car channel reinforcing on heavy-duty tailgates and many other improvements.





New features in cam and roller hoists for heavy-duty chassis

Model F4C hoist shown above is one of a complete line of patented cam and roller hoists, now furnished with many new refinements in construction. The new roller bearing pump is manifolded and can be located on right or left side of cylinder.

Don't miss our exhibit at the ROAD SHOW

Let us send you new bulletins describing in detail the Gar Wood units suitable for your needs. (Check below)

☐ Dump units for 1½ to 2 ton trucks. ☐ "W" and "L" type dump bodies. ☐ Cam and roller hoists. ☐ Telescopic hoists and extra heavy duty bodies. ☐ Mechanical hoists. ☐ Garbage and rubbish bodies.

Exclusive features on outside mounted telescopic hoists and extra heavy-duty bodies for quarries, strip mines, etc.

Here is the most complete line of special heavy-duty equipment available, with bodies equipped with patented downfolding tailgates, box type side members and other features. Hoists include dual telescopic, single telescopic and vertical telescopic types in a range of sizes.

World's Largest Manufacturer of Truck Equipment

GAR WOOD INDUSTRIES, INC. DETROIT MICHIGAN

Highway Protected Against Settlement

(*Continued from page 18*)

had spread it with the bucket. The forms were oiled ahead of the paver by one of the men of the grade crew. The same man helped hand in the top mats which were placed 2 inches from the top of the slab after the first course of concrete had been spread. Following the spreading of the second course, the Lakewood finishing machine completed the surface for the hand finishers. Two men carried back lip-curb concrete in a half drum mounted on two poles.

The two 21-foot slabs were built with a 1-foot strip between, which was later filled with 6 inches of concrete and 2 inches of rock asphalt having a ¼-inch crown. The slabs were finished with a 9/16-inch crown in the center and a tangent carried to the edge. The first finishing operation was the use of the 20-inch flexible wood transverse float followed by two 10-foot drag straightedges. Inequalities in the surface were corrected with a pair of 3-foot x 8-inch hand floats with 15-foot handles. The surface was then gone over with a 12-inch bow belt of 4-ply canvas and rubber.

The lip-curb forms were set by one man who also set the dummy-joint steel in the curb to form the division. A helper roughed in the curb after the two men who brought back the concrete had shoveled the material to place. One finisher completed the lip curb and cut the dummy and expansion joints in the curb and edged that side. The lip curb on this contract was 3 inches high and 9 inches wide, with an ogee curve instead of the usual 3-inch top and slope out to the 9-inch base. One man gave all his attention to cutting the expansion joints, dummy joints and edging one side.

Curing was done by the placing of burlap over the surface as soon as possible after finishing. Two men handled the placing of the burlap and a third sprinkled the burlap for 24 hours. After this preliminary curing period the burlap was removed, the pavement straightedged for high spots and then sprinkled with sodium silicate, using a solution of three parts of the silicate and one of water. The specifications required that the silicate be applied some time between 24 and 48 hours after the pouring of the concrete. The concrete was opened after 14 days of curing.

Batching and Water Supply

The batches for the job were weighed out in a Blaw-Knox batching plant located on a siding about ¼ mile from the south end of the job. A Koehring crane and ¾-yard clamshell unloaded the gondola cars to the stockpiles or direct to the batcher.

Water for the concrete and for sprinkling the grade and for the preliminary curing was supplied by a C. H. & E. triplex pump located on the bank of a bayou near the south end of the contract, and delivering the water through a 2-inch line laid on the shoulder.

Personnel

This contract for FAP 173-E Reopened covered only about one mile of actual paving, but the heavy traffic over the route and the fact that the work had to be done first on one side and then on the other made the work go slowly. Doullut & Ewin, Inc., of New Orleans, La., was awarded the contract for $66,761.32 and the job was run under the direction of T. D. Case as Superintendent. A. W. McWhorter was Resident Engineer for the Louisiana Highway Commission.

Labor Costs in Grade Crossing Elimination

An analysis by the Bureau of Labor Statistics of the reports of contractors on 361 overpasses and underpasses completed under the program of the Emergency Relief Appropriation Act of 1935 indicates that in the construction of 297 overpasses and 64 underpasses, twenty-five cents of each dollar spent went for labor employed by the contractor at the site of the project; forty-two cents for construction material; and thirty-three cents for other expenses, such as equipment, surety bonds, engineering, insurance, workmen's compensation, office work at the site, etc. Each dollar spent for overpasses was distributed among the three items in virtually the above proportions. In the construction of the underpasses, however, 23 per cent went for labor at the site, 39 per cent for construction material, and 38 per cent for other expenses.

Reports from 407 general contractors and 93 subcontractors working on the 361 underpasses and overpasses indicated that 11,043,000 man-hours of labor were created at the site of construction. Site labor includes only the labor hired by the contractors. None of the central office force or executives are included.

The total estimated cost amounted to $25,247,000, of which the payrolls at the site of construction totaled $6,205,000, construction material, $10,558,000 and other expenses, $8,484,000.

A more detailed analysis by geographical divisions appears in an article "Labor and Material Involved in Grade-Crossing Eliminations" by Herman B. Byer, of the Bureau of Labor Statistics in the Monthly Labor Review for September, 1937, published by the U. S. Dept. of Labor.

MADSEN ASPHALT PLANT

The Madsen Asphalt Plant is the finest equipment of its type. It is built in units to assure rapid assembly and dismantling, thereby providing extreme portability and low moving costs. No crane is necessary in the erection of the plant.

Remember too that a Madsen Plant holds the record in the State of California for the highest asphaltic concrete production per eight-hour day.

Write for descriptive literature.

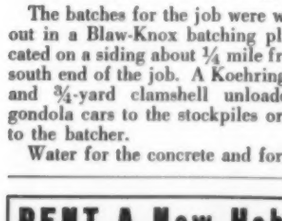
MADSEN IRON WORKS
Manufacturers
Huntington Park, Calif.

HERCULES SUPER-POWER CENTER-LIFT HOISTS and DUMP BODIES

Center-lift hoists lift at center of body where lifting is easiest. Require minimum power - use lowest oil pressures - have double lifting arms - no strain on hinge bolts - no pushing against body hinges. A Hercules hoist for trucks of every capacity.
Steel bodies to meet every requirement - new designs - new improvements in construction.

HERCULES STEEL PRODUCTS CO.
GALION, OHIO

RENT A New Hobart



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---BE SURE TO SEE THE GREATEST HYDRAULIC SCRAPERS ON EARTH TO BE EXHIBITED AT THE CLEVELAND ROAD SHOW JANUARY 17 TO 21 ---HEIL EXHIBIT SPACE NUMBER D4---HEIL SCRAPERS HAVE EVERYTHING INCLUDING GUARANTEED HYDRAULIC SYSTEM AND SPECIAL CUT INDICATOR DEVICE---FREE HEIL LITERATURE IS YOURS FOR THE ASKING--------ADDRESS

THE HEIL CO.
MILWAUKEE, WISCONSIN
HILLSIDE, NEW JERSEY

New Hot-Mix Plant For Miss. Road Job

(*Continued from page* 29)

oiler who checked the contents of the bins at the inspection holes on top of the plant, two dust men emptying limestone dust from cars into the screw conveyor, one crane operator, two men cleaning cars, and one coal roller.

A fleet of four trucks with 800-gallon welded tanks and Jaeger Sure-Prime pumps loaded water from a small stream and sprinkled the grade to assist in bonding the materials and to hold the binder prior to priming the road with the tar.

Laying Base and Top

The last operation before the asphalt base was spread was to cut the grade accurately to crown with a subgrader pulled by the Caterpillar No. 11 diesel patrol grader.

Steel forms were laid for the full depth of the base and top and the asphaltic material spread between them by the trucks dumping to a pair of Burch spreaders which gaged the depth of the material as it flowed from the tail-gates of the trucks. Two men were assigned to each box to hook and unhook the trucks. Two other men at the sides of the Lakewood finishing machine, Type C, worked the edges and center. The screed of the finisher was heated as required before starting each day and when work was stopped for any length of time. There was one operator for the machine for each shift and four rakers immediately behind it. Base course was laid each afternoon and top in the morning. Rolling was done with one 10-ton 3-wheel Buffalo-Springfield gas roller and two tandems of the same size and make. Straight-edging of the surface was done with 10-foot straight-edges and the allowable variation was ¼-inch, although the contractor tried to finish the surface closer than that allowed in the specifications.

The final operation on this contract was the finishing of the shoulders and planting of Bermuda grass by spot sodding.

Personnel

This 13.615-mile paving contract was awarded to The Wesco Co. of Chattanooga, Tenn., on its low bid of $255,348.55. For the contractor the work was under the direction of J. M. Rubin, Superintendent, and for the Mississippi State Highway Department, H. E. Foster was Project Engineer.

Truck-Mounted Breaker Cuts Pavements Clean

A pavement breaker which requires only two men to operate and which will break reinforced as well as plain concrete pavement, bridge abutments, piers, floors and, with a cutting knife replacing the breaking nose, will cut asphalt on a hairline for sewer and pipe-line excavation or between car tracks has been announced by Novo Engine Co., 216 Porter St., Lansing, Mich.

The breaker consists of a structural

The Novo Pavement Breaker

steel frame carrying a hammer which is raised to the extreme upper position and released to fall of its own dead weight. Although the hammer can be raised to the maximum height of 12 feet for extreme cases of breaking, 3 feet is reported to be enough for the majority of breaking jobs, giving more blows per minute and speeding up the work. On a job at Flint, Mich., where one of these outfits was called on to break 10-inch concrete reinforced with ¼-inch steel, it worked in below zero weather with the ground frozen 3 to 4 feet below the concrete.

The price is usually given on a square-yard basis and ranges from 7c to 20c per square yard, depending on the kind of concrete to be broken and the size of the job. Some states specify that concrete shall be broken into 6-inch pieces. This on a standard 9-7-9 highway carries a price of around 9 to 10c per square yard for recently laid concrete. Other states specify man-size pieces. This means breaking so that nothing is over 18 to 24 inches long. An 8 or 9-inch pavement broken into pieces to be handled easily with a 1-yard shovel can be broken at the rate of 750 to 1,500 square yards per day. On this type of work the price is around 7½c per yard. Reinforced concrete with either steel rods or mesh does not change these figures a great deal.

New Vertical File For Engineers' Plans

A new automatic vertical plan file, known as No. 19,043, has been developed by the Hamilton Mfg. Co., Two Rivers, Wis. It uses compressed air to open up the file and the big drawer runs out on rollers.

This new file is always closed when not in operation. There is no top lid to be left open, permitting the file to accumulate dirt. The new file takes just the same floor space as the old style and has the advantage that the top of the file is useful for a reference table or for other files. Designed as an integral part of the Hamilton-Calumet system, this vertical file interlocks with other units.

When automatic operation is desired, a small air-compressor unit must be provided or air must be available. When air is available it is necessary only to pipe it to the files. Air-pressure-regulating equipment is provided on each file unit. A push on the lever and the air opens the file.

NEW 2" & 3" ALUMINUM PUMPS

Model 2-Fig. 22

Lightest weight, 2" size, 98 lbs., 3" size, 108 lbs. 4-cycle engine, speed control, foot and rope starter — available without change. Automatic recirculation control, oil seal, etc. Ask for Bulletin CEM-22.

MARLOW PUMPS, RIDGEWOOD, N. J.

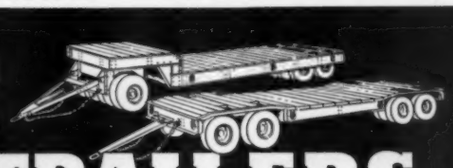
Why Use 1908 Obsolete Barrows in 1938 When
THE AMERICAN STEEL SCRAPER CO., Sidney, Ohio
OFFER 1938 DELUXE CONCRETE WHEELBARROW THAT HAVE EVERYTHING

Quality Is Economy

Load on wheel
Water tight trays
Perfect Balance
Extra Bottom Plate
Guaranteed Handles
On Rubber—of course
Low Cost—for
They actually pay for themselves.

Send for Bulletin No. 45

LA CROSSE Heavy Duty TRAILERS



TWELVE different types . . . Five Tons to Two Hundred Tons capacity . . . Four to Sixteen Wheels . . . Two to Eight Axles . . . Designed to Avoid Highway Damage . . . Simplify your Heavy Hauling Problems . . . Write . . .

THE LARGEST TRAILER IN THE WORLD IS A LA CROSSE !

LA CROSSE TRAILER & EQUIPMENT CO., Funk Bldg., La Crosse, Wis., U. S. A.
SUBSIDIARY OF LA CROSSE BOILER COMPANY

THE R-B EQUIPMENT MANUFACTURING COMPANY,

. . . . . *Best Ads Are Written by Users—*

Actual performance on the job under all conditions definitely establishes the R-B POWER FINEGRADER as a profitable and efficient machine for building subgrade. Plan now to save money on your next paving job by writing, wiring, or phoning for complete information.

Royal Oak, Michigan

WILLIAMS FORM CLAMPS

It costs 8c per cu. yd. of concrete for rod replacement in using Williams Clamps on a form design of 800 lbs. pressure per sq. ft.

Compare this with the cost of your present ties—and you will be added to our list of satisfied Customers.

Order today—24 hr. service—send plans for rod layout.

Williams Form Engineering Corp.
1244 Prospect Ave., S. E.
Grand Rapids Michigan

The Insley Portable Skip Loader for Truck Mixers

Portable-Skip Plant Loads Truck Mixers

A portable-skip transfer plant has been designed by Insley Mfg. Co., Indianapolis, Ind., to set up on the job for charging truck mixers. The proportioned aggregates are hauled from the nearest gravel pit or siding and dumped into the skip with the cement placed on top. The batch is hauled up the ramp and discharged into the truck-mixer. Water is supplied through a control meter which is a part of the plant.

A regulation wrecking truck may be used to set up, dismantle and tow the plant from job to job. This same truck can carry a hoisting drum with a power take-off for operating the skip. The skip is held in position and lowered by means of an automatic brake.

Insley points out the advantage of this plant to the concrete producer who can not haul proportioned aggregates direct from a source of supply to the job and save the cost of rehandling through a central mixing plant. It also reduces the number of mixing trucks required to service the job. The manufacturer states that three mixing trucks with the Insley Skip Transfer plant will displace ten mixing trucks if the job is as much as 5 miles from the central mixing plant. Contractors find advantage in the ready synchronizing of the supply of concrete with the needs of the job.

New Truck-Scrapers And Truck-Graders

A complete line of new models of underbody truck-scrapers and power-reverse truck-graders, in sizes from 8 to 16 feet for mounting on all makes of trucks of 1½ tons and up for road and street maintenance has been announced by the Willett Mfg. Corp., Plymouth, Ind. These units, which contain a number of improvements, are available for operation by compressed air, hand hydraulic pump and full power hydraulic control.

The Model T-14 truck-grader shown in the illustration is a 14-foot combination machine with both flat and curved moldboards mounted thereon, installed on a 5 to 7-ton four-wheel-drive truck and is in service maintaining wide gravel roads in the Northwest. This truck-grader not only has full hydraulic power control with a continuous running oil pump operated off the truck transmission controlling all its operations but it is also tilted from side to side and changes its cutting angle by means of hydraulic controls located in the truck cab. Although the cutting angle is changed hydraulically a special mechanical device holds it in place when working and is automatically synchronized with the hydraulic reversing mechanism.

Extra attachments, such as the combination curved and flat moldboards on the same machine, special curved blades, special scarifier and roller attachments, special curved moldboards for blacktop mix and others are available for all these machines and can be readily attached and used.

Literature describing these units in detail may be secured without obligation direct from the manufacturer by mentioning this magazine.

The New Willett Model T-14 Truck Grader with Both Flat and Curved Moldboards

Mowing Shoulders On County Highways

The mowing of weeds along the right-of-way of county and state highways as well as township and tertiary roads is an important part of maintenance. Many drainage ditches are blocked by weeds in the fall, and high weeds also act as admirable snow-fences, placing the snow right on the road because of their proximity to the traveled way. A one-man highway mower, which is easily controlled by the operator of the tractor, has been produced by the Fate-Root-Heath Co., Plymouth, Ohio, in its Silver King mower.

One man handles the entire job and can cut up or down at an angle of 30 degrees. The mower has an automatic and hand-controlled clutch for increasing the ease of operation, and automatic foot brakes which give a positive stop. The cutter bar cuts close to obstructions and can be quickly detached when it is desired to use the tractor for other work. The cutter bar operates at full power-take-off speed, regardless of the speed of the tractor, and it can be used inside guard rails without obstructing traffic. The tractor operates in low at 1 to 2.5 mph, in second at 3.35, in third at 5.5 and for transportation at 25 mph. The speed in reverse is 1.5 mph. The tractor with the cutter bar in action is just 9 feet wide. It is powered by a Hercules Model IXB 4-cylinder engine, developing 25 hp at 1,400 rpm.

Illustrated descriptive literature on the Silver King highway mower may be secured direct from the manufacturer by mentioning this magazine.

Buckeye
½-⅝-¾ YARD
Clipper
METERED VACUUM CONTROL
big yardage
LITTLE EFFORT
Here's a machine that piles up big yardage without calling for marathon endurance from the operator.
METERED VACUUM CONTROL speeds up digging by making every swing of the dipper fast and accurate. Finger tip pressure by the operator commands instant response from the machine.
SHOVELS Convertible TRENCH HOES
CLAMSHELLS · CRANES · DRAGLINES
THE BUCKEYE TRACTION DITCHER COMPANY
FINDLAY OHIO

"JAHN" TRAILERS ARE BUILT TO TAKE IT!

HERE is a trailer with a combination of advanced engineering features especially suited for heavy duty service.

Look at the double reenforced "goose-neck" construction. This, combined with an unusually rigid "X" type frame, eliminates any possibility of frame sagging or kingpin failure. Recessed flooring protects ends of planking from splintering.

Equal load distribution is accomplished by multiple rear axles consisting of four oscillating type axles placed in dual tandem. Axles are designed and built with the problems of frame stresses definitely in mind and to assure the proper distribution of load and the elimination of frame distortion and frame failure.

If you're in the market for a heavy duty machinery trailer, don't fail to investigate the features these trailers offer. Write or wire—

This is only one of the many Jahn trailers. Jahn trailer designs include complete combinations of wheel arrangements for every type of load, from 5 to 100 ton capacities.
"Come to Trailer Headquarters"

C. R. JAHN COMPANY, Builders Building, Chicago, Ill.

New Cummer Portable Asphalt Plant

Series 1200—for Hot and Cold Mix. Equipped with the Cummer Two-Fire Dryer Cooler.

Series 920—for Hot Mix. Equipped with the Cummer Internal Fire Dryer.

Both plants are built with a new idea in tower units, for portability. Complete plant may be set up in 3-4 days. Supplied with 1, 1½ or 2-ton mixer.

Write for literature

THE F. D. CUMMER & SON COMPANY
17th and Euclid Avenue Cleveland, Ohio

Maintaining Roads In Snowless Winter

(Continued from page 25)

are also equipped with mechanical spreaders. It has been found that these spreaders add greatly to the speed, efficiency, economy and safety in sanding icy roads. Various types of mechanical spreaders are used for this work, consisting of roller and spinner types where power is furnished by means of trailer wheels, and the tail-gate spinner type where power is furnished by means of a motor or a belt-drive from the dual rear wheels.

The sand used is ordered in the fall and stockpiled at convenient points along the road near hills, curves and intersections. The sand is treated with calcium chloride to keep it from freezing and additional calcium chloride is added at the time of application on the road. Calcium chloride aids in melting the ice and the sand becomes imbedded in the ice instead of being swept from the highway by the action of traffic. An experiment of providing shelter for sand piles to keep the rain off has proved to be very effective. Due to the absence of moisture, the sand is prevented from freezing and can be handled much more easily and quickly. The type of covering experimented with consisted of a frame made in the same manner as a tent, so constructed that the sides can be unhooked. They were built of scrap lumber and tar paper in sections which two men could easily lift.

The conditions experienced in the State during the winter of 1936-37 necessitated an unusual amount of sanding work due to the fact that most of our storms came in the form of rain which fell at a temperature below freezing, thus causing the roads to become a sheet of ice.

Clearing Drainage Structures

An essential operation after the roads have been plowed is the clearing and cleaning of all drainage structures in order to provide a run-off when the snow and ice start to melt. This work is not very expensive but is very essential, especially during the days when melting occurs in the daytime and the resulting water freezes at night.

Snow Fence

Snow fence is erected during the fall months in locations where past experience has shown the need of such fence to prevent drifting. During 1936 the Department erected approximately 54 miles of snow fence throughout the State. This snow fence is of considerable value in preventing highways from becoming blocked and also in the saving effected in the amount of plowing required.

Snows of 1936-37

On November 24 and 28, 1936, there were two light snow storms which required plowing and sanding over the greater part of the State. During the month of December there were fifteen days when continual sanding was necessary, which in some cases was required for 24 hours a day for four or five continuous days due to incessant rain. At this time the effectiveness of the sanding was lessened to a large degree by constant freezing and the fact that the sand was washed away, and it was therefore necessary to go over the work many times. The same type of weather continued into January and during thirteen days in this month conditions were similar to those in December. At various intervals there were light snow falls which had to be cleared from the road but the major part of the work was the sanding of icy roads. There were fourteen days in the month of February and eleven days in March when the same conditions were experienced. There was one snow fall in the middle of March which was deep enough to make real plowing necessary. In April there were three days when it was necessary to plow or sand the roads. On April 9 a freak storm left a maximum of 5 inches of snow in Worcester County, necessitating plowing. On April 22 a snow and sleet storm in the Berkshires made plowing necessary in a few places.

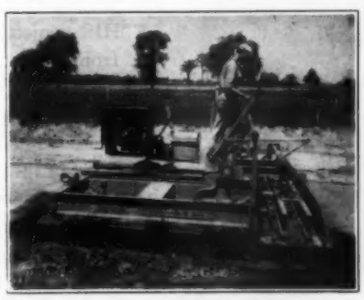
It is apparent from the storm records given above that plenty of work was required properly to maintain our roads during the winter of 1936-37, regardless of the fact that the total depth of snowfall was light compared to a normal year.

Snare Gets Peru Contract

Frederick Snare Corp. of New York City has been awarded a contract for almost $5,500,000 for the construction of a new port at Matarani, Southern Peru, and an extension of the existing port works at Callao. The work will require three years for completion.

FOR 1938

1938 "FLEX-PLANE" Finishing Machines will have outstanding improvements: Outboard crank pin drive and cushioned wrist pin—screed placed 7" closer to frame—screed starter springs—30-Hp. engine takeoff for driving generator where electric vibrator is used—general all-round betterments.



AT ROAD SHOW
Spaces C-35 and C-36

FLEXIBLE ROAD JOINT MACHINE COMPANY
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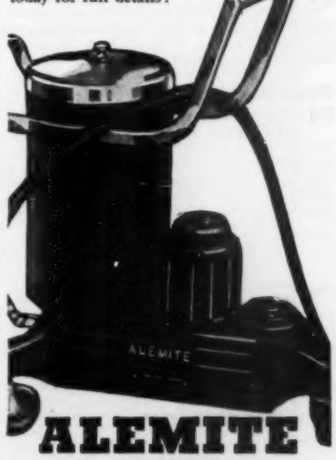
Cut Lubricating Costs for Contractors Everywhere

Wherever contractors are watching costs, you're likely to see an Alemite Power Gun taking care of lubrication. In the shop this gun cuts hours from truck lubrication time, releasing expensive equipment for more productive time.

And even out on the job, miles from the nearest electric lines, Alemite Power Guns on completely equipped service trucks are cutting as much as two-thirds from tractor lubrication time — working with a gasoline-powered air compressor.

Investigate the money-saving possibilities of this modern lubrication method for *your* shop — and out on your important projects! Remember — it doesn't take very many Diesel-tractor-hours or 5-ton-truck hours saved to pay for the finest modern Alemite Power Guns! Mail the coupon today for full details!



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WORLD'S LARGEST MANUFACTURERS OF LUBRICATION PRODUCTS

Enjoy Horace Heidt and his Alemite Brigadiers every Tuesday evening, N.B.C. Coast-to-Coast Network, 9:00 P.M., Eastern Standard Time.

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Please send me complete details about how Alemite Power Guns can save money for me.

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Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

New Streamlined Mixers

502 The new Smith streamlined concrete mixers which are modern in design, appearance and performance, in all sizes and styles, are described in literature which the T. L. Smith Co., 2857 No. 32nd St., Milwaukee, Wis., will be glad to send on request.

New 1938 V-8 Motor Trucks

503 The Ford Motor Co., Dearborn, Mich., will be glad to send to interested contractors and state and county highway engineers complete data on the 1938 Ford V-8 motor truck models including the entirely new line of 122-inch wheelbase one-ton trucks with choice of 85 to 60-hp V-8 engines.

Improved Pavement Breaker

504 Complete information on the improved rapid pavement breaker, consisting of a piston-type pneumatic breaker and Schramm air compressor mounted on a 1½-ton truck and claimed to be faster in operation and transit than previous models, may be secured from the Concrete Cutting Corp. of America, 607 Degraw St., Brooklyn, N. Y.

Hydraulic Wagon Scrapers

505 Continental Roll & Steel Foundry Co., Tractor Equipment Div., Railroad Ave., East Chicago, Ind., will be glad to send to those interested full information on its line of hydraulic wagon scrapers in 4, 5, 7 and 10-yard sizes with balloon-tired wheels and 5, 7 and 10-yard sizes mounted on crawlers.

Rubber-Tire Barrow Wheels

506 Full information on French & Hecht rubber-tired wheels for wheelbarrows which are designed to minimize fatigue, increase loads and lower costs, may be secured by interested contractors and state and county highway engineers direct from French & Hecht, Inc., Davenport, Iowa, and Springfield, Ohio.

Road Maintenance Equipment

507 Literature describing the complete line of Littleford road maintenance equipment, including bituminous distributors, asphalt heating and patching equipment, and the recently acquired Wheeled rollers, may be secured by interested contractors and state and county highway engineers direct from Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio.

Fighting Old Man Winter

508 The Galion Iron Works & Mfg. Co., Galion, Ohio, will be glad to send to those interested complete information on its efficient snowplow attachment for Galion Junior Patrol motor graders for clearing snow from the roads and the Galion sander for sanding icy roads this winter.

Center-Lift Hoists and Dump Bodies

509 Complete details on the center-lift feature of Hercules hoists and dump bodies in sizes to meet all load capacities may be secured by those interested direct from the Hercules Steel Products Co., Galion, Ohio.

Three New 1938 Truck Models

510 Complete details on the three new GMC 1938 truck models, as well as on its line of ½ to 12-ton trucks to meet the varying requirements of the construction industry, may be secured by interested contractors and state and county highway engineers from the General Motors Truck Corp., Pontiac, Mich.

New Concrete Wheelbarrows

511 Complete information on the American DeLuxe concrete wheelbarrow, the feature of which is that the load is actually over the wheel, may be secured direct from the American Steel Scraper Co., Sidney, Ohio, manufacturer of wheelbarrows, scrapers, grading plows and concrete carts.

Derricks and Winches

512 The Saagen Derrick Co., 3101 W. Grand Ave., Chicago, Ill., will be glad to send to those interested complete information on its line of derricks and winches for construction jobs.

Spiral Scarifiers

513 The Moritz spiral scarifier which digs to the desired depth, cuts a smooth bottom surface, chews up old or new roads, and turns and mixes the scarified material is described in a leaflet which may be secured from Moritz-Bennett Corp., Effingham, Ill.

Wet Paint Guards for Traffic Lines

514 Complete information on General traffic line guards which span newly painted traffic lines and bear a red flag to warn off the motorists is contained in literature which the General Road Equipment Co., Hanna Bldg., Cleveland, Ohio, will be glad to send on request.

Tractors Work Round the World

515 An interesting 16-page illustrated booklet "Around the World with Cletrac Crawler Tractors," depicting these units at work in all climates from the Antarctic to the tropics, in countries all over the world and on a variety of jobs, may be secured by those interested direct from the Cleveland Tractor Co., Cleveland, Ohio. Ask for Form 822.

Expansion Joints and Bars

516 Ace-Joints and J-Bars for use in concrete highways are described in literature which the American Concrete Expansion Joint Co., 221 No. LaSalle St., Chicago, Ill., will be glad to send on request.

Chains for Contractors' Use

517 The Carroll Chain Co., Columbus, Ohio, will be glad to send to those interested complete information on its line of chains for all types of requirements on construction jobs.

New Portable Asphalt Plants

518 Literature describing two new Cummer portable asphalt plants, including Series 1200 for hot and cold mix and equipped with a Cummer two-fire drier cooler and Series 920 for hot mix with a Cummer internal fire drier, may be secured direct from the F. D. Cummer & Son Co., 17th & Euclid Ave., Cleveland, Ohio.

Line of Grader Blades

519 Detailed information on Shunk grader blades for any machines, wearing boots, moldboards, maintainers, bulldozers, snow plows and similar equipment may be secured by interested contractors and state and county highway engineers direct from the Shunk Mfg. Co., Bucyrus, Ohio.

Complete Line of Trucks

520 The White Motor Co., Cleveland, Ohio, will be glad to send to those interested complete information on its line of light, medium and heavy-duty motor trucks for 1938.

High-Speed Concrete Vibrators

521 The details of Master high-speed concrete vibrators in a variety of models, with gas or electric power, may be secured by those interested direct from the Master Vibrator Co., Dayton, Ohio.

SEND THIS BACK—WE'LL DO THE REST

CONTRACTORS and ENGINEERS MONTHLY
470 FOURTH AVE., NEW YORK

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MORRISON-KNUDSEN COMPLETES ANOTHER DAM in record time!

In the construction of the Roy B. Inks Dam, New Texaco Motor Oils, Havoline and Marfak were used for cars and trucks, Crater for wire rope and exposed gears. Texaco Ursa Oil for the Diesel tractors, Algol and Alcaid for compressors.

THIS project on the Colorado River, 12 miles from Burnet, Texas, is an example of speed and efficiency in engineering construction.

The dam is 1,557 feet in length with maximum height above bed-rock of 78 feet. The non-overflow section is 112 ft., spillway 870 ft. More than 120,000 barrels of cement, 56,000 cu. yds. of sand and 104,000 cu. yds. of crushed stone were used.

The Morrison-Knudsen Company reported that lubrication was an important factor in this proficiency . . . kept equipment running continuously, lowered maintenance cost, eliminated break-downs.

The lubricants used were TEXACO . . . the contractors putting it up to Texaco lubrication engineers to supply them with the proper lubricants needed for the job.

Trained lubrication engineers are always available for consultation on the selection and application of Texaco Lubricants. Prompt deliveries assured through 2108 warehouse plants throughout the United States.

The Texas Company, 135 East 42nd Street, N. Y. C.

TEXACO

TEXACO *Industrial Lubricants*

Water Works Dam Built for Denver

(Continued from page 41)

inches in diameter were removed. The material for the embankment passed through the plant and was loaded into 30-cubic yard LeTourneau tractor-drawn buggies and hauled to the pervious sections of the embankment. The rejected material went from the grizzly into a bin for rock, and was removed on a conveyor belt and loaded into Hug trucks. This oversize material forms the downstream facing of the dam, which is from 2 to 10 feet in thickness.

The materials were deposited in their respective positions on the embankment and were spread to the specified thickness by bulldozers. Water was supplied [illegible] materials by water tanks and fire [illegible] on various parts of the fill. The [illegible]terials were compacted by La-[illegible]oate sheepsfoot rollers, having [illegible]4 inches in diameter and feet [illegible]ea of approximately 7 square [illegible]ese rollers were loaded with [illegible]nd as required to give a min-[illegible]ure on the feet of 250 pounds [illegible]inch. Twelve passes were re-[illegible]roper compaction of the fill

[illegible] Quarrying

[illegible]rap and for the rock fill [illegible]ream toe of the dam was [illegible] a quarry located in the [illegible] the dam. The rock which was [illegible] at this point is basalt, a very [illegible]k to drill, and extremely durab[illegible] the purpose. Holes were drilled [illegible]ximately 20 feet deep. The drills u[illegible]ere fitted with detachable bits. Hea[illegible]ullivan jackhammers were used for t[illegible] down holes, and a Worthington wagon drill for horizontal and inclined holes. Air was supplied by a battery of Sullivan 310-cubic foot portable compressors. Due to the seamy and blocky character of the rock encountered, the consumption of powder was somewhat above average as the gasses escaped through the seams in the rock formation.

Tunnel Outlets

Two outlets have been provided for the Ralston Creek reservoir, both through the south abutment of the dam. The main outlet is through a tunnel 950 feet long. The auxiliary outlet begins on the upstream face of the dam and extends from there through a part of the pervious fill and a small tunnel to intersect the main outlet tunnel at the valve chamber which is located 250 feet from the upstream end. In this valve chamber is also located a 4 x 5-foot emergency slide gate. Upstream from the valve chamber the tunnel is 72 inches in diameter. Downstream from the chamber it is a 10-foot horseshoe containing a 60-inch steel pipe with a walkway for access to the valve chamber. The auxiliary outlet is 30 inches, inside diameter.

The shale through which these tunnels were driven, as is characteristic of all Pierre shale, broke down rapidly upon exposure to air. Therefore after excavation it was necessary to spray the shale with a film of emulsified asphalt which sealed it from the air and preserved its original condition.

The 250-foot pressure section upstream from the valve chamber was excavated by hand, it being so small that it did not readily admit excavating equipment. The 10-foot horseshoe was excavated in the same manner as any other rock tunnel, with the exception that at no place in the tunnel was blasting permitted within 2 feet of the finished surface. Such material as remained after the cut-holes were shot was usually excavated by means of spaders in order that the formation would not be unduly

Outlet Tunnel of Ralston Dam, Showing Completed Tunnel in the Background, and Reinforcing in the Foreground

shattered. Muck was removed from the downstream end of the tunnel by a scraper-hoist mucking machine. Motive power was furnished by a 4-ton battery locomotive.

The auxiliary outlet tunnel was driven 4 x 5 feet by hand methods. Only two holes were allowed to be shot in the center of the face. All other excavated materials were removed by spading so as to prevent undue shattering of the shale.

Tunnel Lining

The concrete lining of the tunnel upstream from the valve chamber was poured in one continuous operation between necessary construction joints. The full circle was placed at once, this being necessary because the tunnel was under a high pressure. Downstream from the valve chamber the invert for the tunnel was placed first. About half of the tunnel lining was placed by means of a Pressweld concrete placer and about half by a Pumpcrete placer. Very satisfactory results were obtained from both machines. The lining for the auxiliary tunnel is a 30-inch Lock Joint precast culvert pipe placed on line and grade, and entirely surrounded by concrete. Concrete outside the tunnel was placed by conventional methods, a one-cubic yard paver being used. The concrete materials were all batched by weight at a central batching plant and were hauled to the mixer, which was placed at the site of the work, in batch trucks having a capacity of two 1-yard batches.

Personnel

The work on the dam was started on June 26, 1936. As it was a PWA project, work was permitted 7 days a week, but because of labor union regulations, work was limited to 5½ days a week, with a maximum total of 40 hours per week per man. All items of work were completed December 31, 1937.

Ralston Dam was constructed with PWA funds under contract with the United Construction Co., Winona, Minn., by the Denver Board of Water Commissioners, of which Col. H. S. Crocker is Consulting Engineer. Col. Crocker has built up a special staff to handle all the Moffat Tunnel extension work. A. A. Matthews is Supervising Engineer, E. H. Schneider, Designing Engineer, and the writer was Field Engineer in charge of the dam. Consultants on the various phases of the work included Charles H. Paul, R. J. Tipton, and Alvord, Burdick & Howson. George C. Leonard was Superintendent for the contractor.

Scheuerman of Jaeger Dies

The death of Elmer J. Scheuerman, Sales Manager of the Jaeger Machine Co., Columbus, Ohio, on November 26, deprived the construction industry of a man well-known and honored. For twenty years he had been associated with Jaeger Machine Co. and Lakewood Engineering Co.

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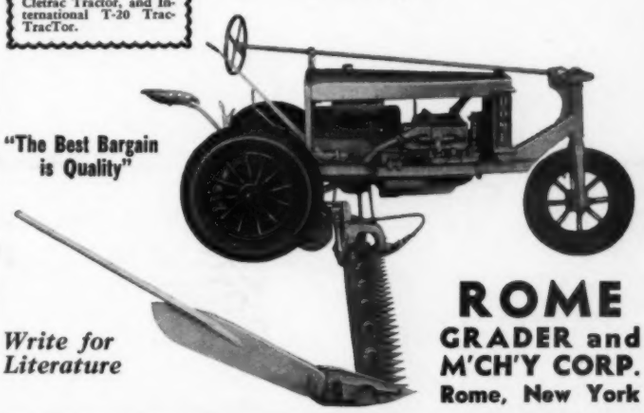

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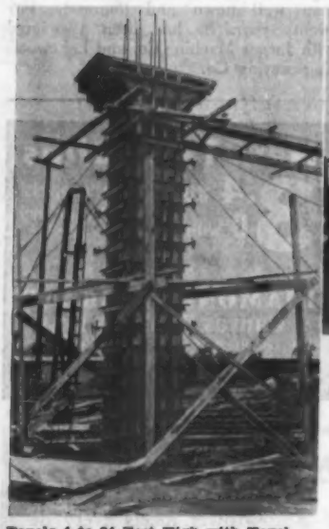


Panels 4 to 24 Feet High with Novel Arrangement of Wales and Form Clamps Featured the Column Forms on This 1,583-Foot Overpass North of Memphis, Tennessee.

C. & E. M. Photos

Forms for the Bent Caps and the Concrete Placing Were Handled in an Unusual Manner by Hickman & Long on the Jackson Avenue Overpass at Memphis. See Page 33.

Set Up Adjacent to a Spur Track, This 100-Ton Per [illegible] Asphalt Plant Was Used by The Wesco Co. to Furn[illegible] the Hot-Mix and Topeka for Its 13.6-Mile Job a[illegible] Miss., Last Summer. See Page 1.

Massachusetts' Winter Maintenance Methods. Sanding a Heavy Grade with a Roller-Type Spreader and Pushing Back Snow on the Shoulder with an Emergency Tractor Plow Followed by a Truck-Mounted One-Way Plow Cleaning Up. See Page 1.

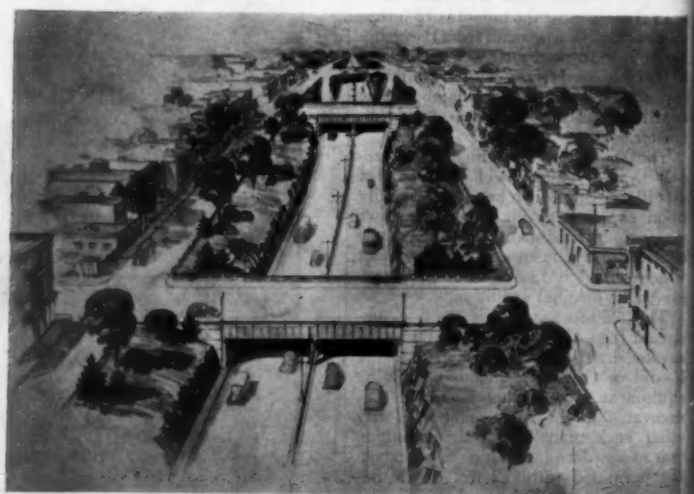
Combined Jumbo and Cherry Picker Which Permitted Easy [illegible] Drills, Rapid Movement of Empty Cars, and Passage of the Mu[illegible] Jumbo. This Device Was Used by Morrison-Knudsen Co. on [illegible] the Roza Project. See Page 2.

[illegible] of the [illegible]ugh the [illegible] No. 3 of

It's an Old New York Custom! Playboys on a Western New York State Highway Job Roll Each Other in the "Mud" to Celebrate the Final Pour of Concrete. See Picks and Shovels, Page 20.

Loading Material for the Pervious Sections of Ralston Dam, One of the Ten Highest Earth Dams in the World, Built for the Denver Water Board 17 Miles Northwest of Denver. See Page 41.

Paving a Roadway Beneath George Washington Bridge at 178th Street and Riverside Drive, New York City, Using a 10 to 12-Foot Flexplane Finishing Machine with Concrete Delivered by a Pumpcrete Unit. Duffy Construction Corp., New York City, Was the Contractor.



General View of the New Jersey Approach to the South Tube of the Lincoln Tunnel, the Newest Link Between New Jersey and New York, Which Was Opened to Vehicular Traffic on December 22, 1937. The North Tube Will be Completed in 1941, After Which Time Each Tube Will Carry One-Way Traffic. See Page 11.